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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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77-1820. Counc. Agric. Sci. Technol. **Living dangerously.** *Agric. Eng.* 58(7): 44; 1977.

Comments are made on the television documentary "Living Dangerously" which dealt with the dioxin release incident at Seveso, Italy. The documentary is depicted as being overdramatized and scientifically inaccurate in certain points. The points to which objections are raised include the indestructibility of dioxin, likelihood of poisoning by dioxin in 2,4,5-T herbicide, effects on the Vietnamese population, comparisons of dioxin with with botulism and thalidomide, effects of burning contaminated vegetation, and lack of a safe exposure level for dioxin.

77-1821. Gulyas, F. (Nat. Inst. Soil Sci. Agrochem., Budapest, Hungary). **A VII. Talajbiologiai Tudomanyos Ules. [7th Soil Biology Conference.]** *Agrokem. Talajtan* 25(3/4): 421-424; 1976. (Hungarian)

Highlights are presented of the 7th International Soil Biology Conference on "Soil Biology and Environmental Protection", held on Sept. 2-4, 1975, at Keszthely, Hungary. Many papers were concerned with the interaction of pesticides and soil microorganisms. Soil microorganisms play the major role in the detoxification of pesticides. Easily assimilable organic matter enhances the detoxifying action of soil microorganisms. The toxicity of herbicides may be increased or decreased by microorganisms, depending on the species. Morphological changes were observed in *Nocardia* under the influence of 2,4-D.

77-1822. Laporte, J. R. (Dept. Pharmacol., Univ. Autonoma de Barcelona, Barcelona, Spain). **Effects of dioxin exposure.** *Lancet* 1(8020): 1049-1050; 1977. (10 references)

A Letter-to-the-Editor states that dioxin is rarely encountered as a pure compound, but rather in combination with other chemicals. When discussing dioxin toxicity in man, two situations must be considered: exposure to a high dose of dioxin only once or for a few days as in industrial accidents; and exposure continuously to low or variable amounts as in Vietnam and Colombia. Six types of disorders have been associated to dioxin exposure: cutaneous disorders such as chloracne; ocular including both acute and subacute or chronic conditions; blood disorders, hemorrhage; hepatic disorders clinically resembling viral hepatitis; abortion, teratogenesis, and chromosomal aberrations; and carcinogenesis.

77-1823. Haley, T. J. (Natl. Cent. Toxicol. Res., Jefferson, AR). **Maleic hydrazide: should the Delaney amendment apply to its use?** *J. Toxicol. Environ. Health* 2(5): 1085-1094; 1977. (66 references)

The chemistry, metabolism, toxicology, mutagenicity, and carcinogenicity of maleic hydrazide have been reviewed. There is little doubt that this chemical is a mutagen and a carcinogen in cell cultures and animals. However, no evidence is available on human carcinogenicity regardless of population exposure in manufacturing, agriculture, and the food chain. An epidemiological survey should be conducted to determine possible human carcinogenicity in these populations. Also a long -term ingestion study should be performed as well as biotransformation studies. Oral ingestion is the only appropriate method for evaluating the possible carcinogenicity of a food additive because other routes of administration develop data that are irrelevant to the intent of the Delaney clause.

77-1824. Cranmer, M. F. (Natl. Cent. Toxicol. Res., Jefferson, AR). **Estimation of risks due to environmental carcinogenesis.** *Med. Pediatr. Oncol.* 3(2): 169-198; 1977. (45 references)

Several Federal agencies share responsiblility for enforcing laws designed to control human exposures to carcinogens. Such enforcement often has immense effects on other factors of the environment. While absolute safety is not possible, increased protection is obtainable. The ability not only to detect but also to quantify relative risk must be improved. Relative risk and benefit can only be compared using quantified data. Examples of the inexactness of current toxicological, epidemiological, and mathematical models for estimating risk due to exposures to DDT, aflatoxin-bl, DES, and benzidine are presented. Different laws and regulations applicable to the control of these agents are compared. Reference is made to major programs in toxicological methods for risk estimation.

77-1825. Lockeretz, W.; Klepper, R.; Commoner, B.; Gertler, M.; Fast, S. (Ctr. Biol. Natur. Syst., Washington, Univ., St. Louis, MO). **A comparison of the production, economic returns, and energy-intensiveness of corn belt farms that do not do not use inorganic fertilizers and pesticides.** *Natl. Tech. Inform. Serv.* PB-247,468, 1975, 68 p.

The report compares crop production on a sample of 16 mixed crop-livestock farms in the Corn Belt on which no inorganic fertilizers and almost no pesticides are used, to that of a matched sample that uses conventional fertilization and pest control practices. In the 1974 crop year, the market value of the crops raised per acre was slightly higher on the conventional sample (an average of 8%), but this difference was not statistically significant at the 90% probability level. There was no difference between the two group's crop production returns, that is, value of production less operating costs. The operating costs on the conventional farms were greater for fertilization and pest control, but other costs were about equal for the two samples. The energy intensiveness (defined as energy input divided by value of production) on the farms that do not use fertilizers is an average of one-third as much as that of the conventional group. This difference arises almost entirely from the latter's use of energy-intensive fertilizers, primarily anhydrous ammonia and other forms of nitrogen. (Author abstract by permission)

77-1826. Commoner, B.; Gertler, M.; Klepper, R.; Lockeretz, W. (Washington Univ., St. Louis, MO). **The vulnerability of crop production to energy problems.** *Natl. Tech. Inform. Serv.* PB-247,756, 1977.

The energy consumed in producing 14 field crops under a variety of conditions has been determined. The cost of this energy in both 1970 and 1974 has also been calculated. The energy considered includes both direct consumption (for field equipment, crop drying, irrigation pumping, and hauling) and indirect consumption through purchased inputs (fertilizers and pesticides). For each crop, the impact of energy price increases has been expressed through two indices involving the increased amount paid for energy to produce one unit of crop. In the first index, this is compared to the increase in the total direct production cost; in the second index, it is compared to the increase in the price received per unit of crop in the same period (1970-1974). In most cases studied, energy price increases have not been significantly greater than price increases for other purchased inputs, so that there is no strong incentive to substitute less energy-intensive methods. However, since energy price increases could continue, and energy supply problems could become aggravated, such substitutions may become more important in the future. Several such substitution possibilities are discussed. (Author abstract by permission)

77-1827. Kay, D. A. (Am. Soc. Internat. Law, Washington, DC). **The international regulation of pesticide residues in food. A report to the National Science Foundation on the application of international regulatory techniques to scientific/technical problems.** *Natl. Tech. Inform. Serv.* PB-247,969, 1975, 132 p.

The purpose of the research is to select, survey, and explore the possibilities of actively applying the spectrum of existing international management and regulatory techniques to the practical solution of six selected scientific and technological problems of six selected nations, and to suggest conditions under which these techniques might be applied toward the resolution of technology-related trans-national policy issues. This report considers the problem of pesticide residues in the world food supply. There are 7 sections: international regulation of pesticide residues, the international dimension of the problem, the establishment of Codex Alimentarius, other international organizations dealing with pesticide residues, bilateral arrangements, CCPR systems, and the U.S. in relation to international regulation. (Author abstract by permission)

77-1828. Midwest Res. Inst. (Kansas City, MO). **Initial scientific and minieconomic review of monuron. Substitute chemical program.** *Natl. Tech. Inform. Serv.* PB-248,110, 1975, 120 p.

This is the eighth in a series of in-depth scientific literature searches which review the safety and efficacy of substitute chemicals registered by EPA as possible replacements for cancelled or suspended pesticides or pesticides in litigation. The reviews are part of the Substitute Chemical Program, initiated under PL 93-135 (Oct. '73). This report on monuron, a registered substitute herbicide for certain cancelled and suspended uses of 2,4,5-T, covers all uses of monuron and is intended to be adaptable to future needs. The data contained in this report was not intended to be complete in all areas. Data searches ended in April, 1975. The review was coordinated by a team of EPA scientists in the Criteria and Evaluation Division of the Office of Pesticide Programs. Draft copies of the report have been reviewed by the scientific staffs of EPA's National Environmental Research Centers and their associated laboratories. E.I. du Pont de Nemours and Co., a manufacturer of monuron, reviewed the draft of this report and made certain comments and additions. (Author abstract by permission)

77-1829. von Rumker, R.; Carlson, G. A.; Lacewell, R. D.; Norgaard, R. B.; Parvin, D. W., Jr. (RvR Consultants, Shawnee Mission, KS). **Evaluation of pest management programs for cotton, peanuts and tobacco in the United States.** *Natl. Tech. Inform. Serv.* PB-248,113, 1975, 631 p.

Pest managment programs for cotton, peanuts, and tobacco plants in seven states were evaluated re users, locations, and characteristics; program costs; effects on crop yield; pesticide use; production costs; and growers' profits. The environmental impact and the biological and economic feasibility of each program were studied, and the constraints on the expansion of pest management programs and the applicability of the findings of this study to other crops were assessed. Regional reports containing detailed information on the programs studied are included as appendices. (Author abstract by permission)

77-1830. Lockeretz, W.; Klepper, R.; Commoner, B.; Gertler, M.; Fast, S. (Ctr. Biol. Natur. Syst., Washington Univ., St. Louis, MO). **A comparison of organic and conventional farms in the Corn Belt.** *Natl. Tech. Inform Serv.* PB-248,135, 1975, 30 p.

The widespread use of chemical fertilizers and pesticides has been credited with the high productivity of the U.S. farmer, but recent increases in the prices of these chemicals and concern about their ultimate environmental effect have raised questions about our continuing reliance on them. The paper reports a preliminary investigation of the crop production, profitability, and energy consumption of 16 organic and 16 matching conventional farms in the Corn Belt. This paper is a condensed version of a more detailed report, "A Comparison of the Production, Economic Returns, and Energy Intensiveness of Corn Belt Farms That Do and Do not Use Inorganic Fertilizers and Pesticides." This report outlines the background of the problem, research methods, findings, results and implications of the study. (Author abstract by permission)

77-1831. Center for the Biology of Natural Systems

(Washington Univ., St. Louis, MO). **Development of strategies to reduce the vulnerability of United States agriculture to disruptions from energy shortages and price increases. First year report, June 1974 through July 1975.** *Natl. Tech. Inform. Serv.* PB-248,288, 1975, 13 p.

The objective of the study was to identify the adverse effects energy shortages and price increases could have on U.S. agriculture, and to evaluate alternative production strategies to minimize these effects. This study develops an Energy Vulnerability Index to estimate how seriously both energy shortages and price increases could disrupt the production of major agricultural commodities. It also analyzes production methods, comparing the energy use of conventional production methods (high in application of nitrogen fertilizers and synthetic pesticides) with that of organic production methods. (Author abstract by permission)

77-1832. Elgin, D. S.; MacMichael, D. C.; Schwartz, P. (Ctr. Stud. Social Policy, Stanford Res. Inst., Menlo Park, CA). **Alternative futures for environmental policy planning, 1975-2000.** *Natl. Tech. Inform. Serv.* PB-248, 796, 1975, 285 p.

This report covers the next twenty-five years -- 1975 to 2000, essentially from the perspective of possible futures for the United States placed within a world context. By exploring the uncertainty of the near-term future and placing boundaries on it, the authors believe they have provided the environmental policy planner with an important tool for anticipating issues and gauging the utility of policies designed to meet them. The approach to the construction of the alternative futures entailed the projection of certain driving, or key, trends over the next 25 years and estimating the social, economic, and political consequences of a varying combination of their impacts. Certain key policy questions provided by EPA were placed in the context of these futures and conclusions were drawn therefrom. (Author abstract by persmission)

77-1833. Off. Res. Develop. (Environ. Protect. Ag., Washington, DC). **Environmental research outlook for FY 1976 through 1980: report to congress.** *Natl. Tech. Inform. Serv.* PB-250,523, 1976, 166 p.

This report represents the first attempt by the Office of Research and Development (ORD) to present a 5-year overview of ORD's research program, priorities and trends. The report will be updated annually. This overview is broken into ORD's five major programs which are: Health and ecological effects; Industrial processes; Public service activities; Monitoring and technical support; and Energy/Environment. ORD's working agreements with other Federal Agencies are also briefly described. In the near-term ORD has given priority to strengthening the Health and Ecological Effects Program. Another priority area is the Industrial Processes Program where pollution control technology R&D is needed if the 1985 water quality goals are to be more closely met. Emphasis will also be placed on monitoring and quality assurance R&D which support Agency regulatory actions. (Author abstract by permission)

77-1834. Hay, A. (Author address not given). **Seveso: Roche's reply.** *Nature* 267(5614): 749; 1977.

Attempting to answer criticism of its subsidiary Givaudan, the Hoffman-LaRoche Co. has published an internal newsletter on the Seveso situation. The actual cause of the accident is still unknown. To protect the employees in case of accident the safety valve and vent pipe for the trichlorophenol plant were placed to discharge the reactor contents away from the confines of the factory, thus resulting in widespread contamination. The delay in reporting what had happened to government authorities was attributed to the desire to have accurate information about the incident first. Roche's director of clinical research says the health situation at Seveso is reassuring, but recommends that persons in high risk groups continue to be monitored. The Givaudan Co. has refused to pay for a biochemical monitoring program in the exposed population unless government authorities give serious consideration to a decontamination proposal involving spraying vegetation with a mixture of olive oil and cyclohexanone.

77-1835. Hawkes, N. (Author address not given). **Seveso revisited.** *Science* 197(4299): 143; 1977.

Some evidence gathered in the year since the Seveso disaster has indicated that the dioxin pollution is not as serious as was initially feared. The children with chloracne are recovering. Women at critical stages of pregnancy at the time of the pollutant release have delivered their babies without a statistically elevated incidence of abnormalities. Houses were vacuumed inside and washed on the outside with detergent solution. Wipe tests revealed that 90-100% of the dioxin in and on the houses was removed by these techniques. Uncertainty remains over decontamination of the most seriously affected areas immediately around the plant. Incineration techniques would provide for rapid pollutant destruction but might further disperse residues; agricultural techniques would be slower but more environmentally acceptable.

77-1836. Wakatsuki, S. (Saku Gen. Hosp. Nagano, Japan). [**Studies on the effects of agricultural pesticides on living bodies (studies commissioned by the ministry of health and welfare in fiscal year 1975).**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(1): 42-48; 1975. (Japanese)

Excerpts from studies on the effects of agricultural pesticides on living bodies were described from the viewpoint of pesticide intoxication. The results were broken down into 3 divisions; diagnostic standards of pesticide intoxication, pesticide residues in living bodies, and therapeutics. The number of accidental intoxications of pesticide applicators has not decreased; although the

number of severe cases are decreased, the number of slighter ones, especially dermal impairment, is increasing with the increased application of mixed pesticides. Two guidelines were produced on the effects of pesticides on living bodies: (1) adoption of the DTNB method for determination of whole blood cholinesterase, and (2) discovery of a greater frequency of abnormal EEG (slow alpha waves, etc.) among persons who apply large amounts of pesticides. Although mercurial and organochlorine pesticides were banned, the tracing of their residues in human bodies is being continued. The fate and effects of organophosphorus pesticides especially were studied clinically and by using experimental animals. Although the life of the pesticides in living body was found to be very short, seemingly irreversible changes appeared at the neuromuscular junction plate.

77-1837. Schaer, M. (Inst. Sozial-Praeventivmed., Univ. Zurich, Switzerland). **Auswirkungen der Umweltverschmutzungen auf die Gesundheit. [Effects of environmental pollution on health.]** *Schweiz. Rundsch. Med.* 66(14): 441-445; 1977. (6 references) (German)

Adverse effects of environmental pollution on human health may be caused by air pollution, giving rise to pulmonary and cardiovascular diseases, or less frequently by water pollution, especially when contaminants are accumulated by plankton or fish. Risks of food contamination, especially by pesticides, have been widely publicized. Laws have been passed and monitoring programs established to prevent excessively contaminated food from being sold. The health risks due to bacterial contamination of food far exceed the dangers of chemical contamination.

77-1838. Veith, G. D.; Kuehl, D. W.; Puglisi, F. A.; Glass, G. E.; Eaton, J. G. (Environ. Protect. Ag., Environ. Res. Lab., Duluth, MN 55804). **Residues of PCBs and DDT in the western Lake Superior ecosystem.** *Arch. Environ. Contam. Toxicol.* 5(4): 487-499; 1977. (17 references)

Fish from western Lake Superior (1972-73) contained DDT and PCB residues at concentrations greater than 0.1 ppm. The most predominant PCB's were those containing 3 to 6 chlorine atoms per molecule, and GLC data indicated that the mixtures were most like the commercial product Aroclor 1254[2]. Other chlorinated contaminants identified by GC/MS analyses and occurring at concentrations less than 0.1 ppm were hexachlorobenzene (C_6Cl_6), chlordane, nonaclor, and dieldrin. Lindane, which has been previously reported in Lake Superior, was below the detection limit of approximately 0.01 ppm. The relationship between the size of lake trout and the concentration of total DDT in the fish was compared to measurements reported in previous studies. The comparison suggests that DDT residues have declined since 1968. The concentration of PCBs was estimated to be 0.8 ng/L in Lake Superior water and 0.1 ppm in large zooplankton. The apparent bioconcentration factor for PCBs in Lake Superior fish ranged from 10^5 to 10^6. The concentration of total DDT and PCBs in the larger Lake Superior fish exceeded the 5 ppm tolerance level establishment by the U.S. Food and Drug Administration for these chemicals in fish to be used for human consumption.

77-1839. Baluja, G.; Murado, M. A.; Herrandez, L. M. (Instituto de Quimica Organica, Juan de la Cierva 3, Madrid-6, Spain). **Organochlorine pesticides and PCBs distribution in tissues of purple heron and spoon duck from the biological reserve of Donana (Spain).** *Bull. Environ. Contam. Toxicol.* 17(5): 603-612; 1977. (15 references)

Organochlorine residues in samples of muscle, liver, kidney, brain, gonad and eggs from purple herons (*Ardea purpurea*) and spoon ducks (*Anas clupeata*) collected from the Biological Reserve of Coto Donana, Spain during the period 1972-1974 were measured using electron capture gas chromatography. The concentrations of the residues in the tissues increased in the following order: cyclodienes, hexachlorocyclohexanes, DDTs, PCBs. Among the pesticides, DDT was found in the highest concentrations, with DDE being the major fraction. DDE accumulation was particularly high in the gonads and eggs. PCBs were the major organochlorine residues found. Levels of all residues were greatest in the gonads and brain, with unexpectedly high levels in the liver. Total residue levels increased from 1972 to 1973 in the purple herons and to a lesser extent in the ducks.

77-1840. Fukano, S.; Doguchi, M. (Tokyo Metropolitan Res. Lab. Public Health, Shinjuku-ku, Tokyo 160, Japan). **PCT, PCB and pesticide residues in human fat and blood.** *Bull. Environ. Contam. Toxicol.* 17(5): 613-617; 1977. (9 references)

PCBs and PCTs were measured in blood samples collected from 10 human subjects in 1973 and 1975, and PCTs, PCBs, DDT, and BHC were measured in samples of adipose tissues collected from 18 human males and 12 females in Tokyo in 1974. Analysis was by gas chromatography. The average levels of PCTs and PCBs in human fat were 1.11 + 2.01 and 1.04 + 0.59 ppm, respectively. There were no significant differences or correlations between the levels of the two substances in the samples. The levels of the ortho, meta, and para isomers of PCT were 8%, 47%, and 45%, respectively. The blood PCT levels ranged from 0.7 to 19.6 ppb in 1973 and from 1.1 to 9.4 ppb in 1975. The blood PCB levels ranged from 2.2 to 5.1 ppb in 1973 and from 1.8 to 3.8 in 1975. With one exception, the levels of the two substances did not vary significantly in the subjects between 1973 and 1975. The mean concentration of total BHC and DDT in the fat samples was 2.36 and 3.59 ppm, respectively. The BHC level, but not the DDT level, was significantly lower than that determined in a previous study in 1971.

77-1841. Zimmerli, B.; Marek, B. (Eidgenoss. Gesundheitsamt, Abt. Lebensmittelkontr., Sekt. Pestizidrueckstaende Kontamin., Bern, Switzerland). **Der Uebergang biozider Stoffe aus Anstrichen in die Gasphase: Tetrachlor-isophthalonitril (chlorothalonil). [Migration of biocides from paints into the gas phase: chlorothalonil.]** *Chemosphere* 6(5): 215-221; 1977. (16 references) (German)

Experiments on the transfer of biocides from paints and other coatings into indoor air were performed using chlorothalonil, a fungicide of relatively low vapor pressure, in an office room. Air samples were passed through a glass tube packed with chromosorb 102; with a sampling time of 2 hr, the total air volume was about 0.3 m^3. The collection system was washed and eluted with hexane, and the test solutions examined by gas chromatography without further purification. The chlorothalonil levels obtained varied little for different sampler positions in the room, and averaged about 2.4 $\mu g/m^3$ of air. Calculations indicated that sorption of chlorothalonil on dust could account for only about 7% of the measured value, so that most of the chlorothalonil must have been present in gaseous form. The concentration of chlorothalonil in air increased with increasing air temperature in a manner indicating that the vapor pressure fluctuations were responsible for the increase. A person remaining in such a room could be estimated to incorporate a total of 15 μg chlorothalonil in 24 hr, assuming 50% absorption by the respiratory tract. An estimate of the amounts of other compounds that would be taken in under these conditions indicated that the acceptable daily intake values could be exceeded in some cases.

77-1842. Norstrom, A.; Andersson, K.; Rappe, C. (Dept. Org. Chem., Univ. Umea, Sweden). **Studies on the formation of chlorodibenzofurans by irradiation or**

pyrolysis of chlorinated diphenyl ethers. *Chemosphere* 6(5): 241-248; 1977. (15 references)

The formation of chlorodibenzofurans by pyrolysis or irradiation of chlorinated diphenyl ethers was studied. As previously reported the photolysis of chlorinated diphenyl ethers (PCDEs) follows two competitive reaction pathways, reductive dechlorination or ring closure to dibenzofurans. At least one *o*-chlorine was needed to give dibenzofurans. When available, *o*-chlorine was usually cleaved first. The degradation rate was found to be dependent on concentration, i.e., the disappearance of the last part of the substance from the ecosystem will take considerably longer periods of time. The pyrolysis of the four tetrachlorinated isomers resulted in good recovery only of unchanged starting material. However, this does not exclude the possible formation of trace amounts of polychlorinated dibenzofurans (PCDFs), as the detection limit in this case was about 1%. The photochemical ring closure of *o*-chlorine substituted diphenyl ethers to dibenzofurans seems generally significant and can have environmental implications. The PCDEs are impurities in commercial chlorophenols widely used as herbicides and fungicides and it is therefore recommended that the levels of PCDEs in chloropheols should be kept to a minimum.

77-1843. Wurziger, J.; Dickhaut, G. (Chem. Lebensmitteluntersuchsanst., Inst. Hyg., Hamburg, Germany). **Ueber Schaedstoffe in Fettfischzubereitungen. [Harmful substances in fatty fish preparations.]** *Fette-Seifen-Anstrichmittel* 79(4): 165-170; 1977. (7 references) (German)

Fish and fish products were analyzed for DDT and PCB following different types of processing. The values obtained in fish oil were partially correlated with oxidative changes in the fats. Both oxidized and toxic components were removed during the hardening process. In fish intended for direct consumption the levels of contaminants will vary with the age, and therefore the size, of the fish. Mercury levels in canned sardines in oil were quite low, especially since most of these fish are small and thus less than 4 years old. DDT contents of < 0.01-3.4 ppm were found. Large old fish should be separated from the catch immediately and processed separately, either to ensure proper removal of contaminants or to permit their processing into oils from which harmful substances can be removed after refining and hardening.

77-1844. Attri, B. S.; Lal, R. (Indian Agric. Res. Inst., New Delhi, India). **Residues and residual toxicity of ethyl and methyl parathion on cauliflower.** *Indian J. Agric. Sci.* 44(6): 361-365; 1974. (12 references)

Cauliflower (*Brassica oleracea* L. var. botrytis L.) was sprayed with either parathion or methyl parathion 15 days before harvest in Jan.-Feb. 1971. Estimates of pesticide residues by bioassay and chemical assays were significantly correlated. When parathion was applied at 0.325 kg/ha residues were below the tolerance limit of 1 ppm after about 6 days on curds and 9 days on leaves; dissipation took longer at the higher application rate. Methyl parathion residues declined to the tolerance level within 4 days on curds and 7 days on leaves when applied at 0.325 kg/ha.

77-1845. Joia, B. S.; Kalra, R. L. (Punjab Agr. Univ., Ludhiana, India). **Note on the dissipation of ultra-low-volume formulations of endosulfan, fenitrothion, fenthion and malathion on okra.** *Indian. J. Agric. Sci.* 44(12): 897-898; 1974. (6 references)

This study on the dissipation of ultra-low-volume formulations of endosulfan, fenitrothion, fenthion, and malathion on okra was undertaken to determine their suitability from the view of safety to consumers. The insecticides were applied at 150, 150, 100, and 250 g ai/ha, resp., on 55-day-old crops. About 1 kg of fruits of about 5 cm in size were taken from each of the 3 replications at 0, 1, 2, 4, and 5 days after spray. The formulations gave initial deposits of 0.16, 0.14, 0.22, and 0.22 ppm, resp. These values were much lower than those obtained with high-volume sprays. The dissipation rates of the formulations were quite high. About 44% of endosulfan, 71% fenitrothion, 32% fenthion and 64% of malathion dissipated in 1 day. At the end of 2 days, the residue levels were 0.07, 0.014, 0.07, and 0.02 ppm, resp. Degradation was rapid with fenitrothion and malathion (about 90% after 2 days), endosulfan (about 81% after 5 days), and fenthion (about 91% after 5 days). There was no significant difference in the rates of dissipation between high-volume and ultra-low-volume sprays. As the initial deposits of each of the insecticides were much lower than the levels of tolerance, the use of these insecticides at these dosages is considered safe for the consumer.

77-1846. Sawicki, E. (Environ. Protect. Ag., Research Triangle Park, NC). **Chemical composition and potential "genotoxic" aspects of polluted atmospheres.** *IARC Sci. Publ.* 16: 127-157; 1977. (202 references)

The composition of the atmosphere was analyzed in terms of gaseous, vapor and particulate phases and with reference to background, urban and highly polluted levels. The inadequate knowledge regarding chemical compositions of polluted atmospheres and other environments worsens continuously with production of new pollutants. Literature data indicate a greater prevalence of genotoxic effects in humans than is commonly believed, and that genetic or somatic mutations may be accountable for a large fraction of human ills. Measurements performed on the vapor phase of the ambient atmosphere, sampled at the Sargasso Sea, revealed *p,p'*-DDT at 0.00001-0.00003 $\mu g/m^3$, *o,p'*-DDT at 0.00001-0.00004 g/m^3 and chlordane at 0.000005-0.00009 g/m^3.

77-1847. Pease, H. L.; Holt, R. F. (Biochem. Dep. Exper. Stn., E. I. Du Pont De Nemours & Co. Inc., Wil-

mington, DE 19898). **Manganese ethylenebis (dithiocarbamate) (maneb)/ ethylenethiourea (ETU) residue studies on five crops treated with ethylenebis (dithiocarbamate) (EBDC) fungicides.** *J. Agric. Food Chem.* 25(3): 561-567; 1977. (17 references)

Analysis of tomatoes; potatoes, cucumbers, summer squash, and cantaloupes taken from 17 different locations throughout the United States where maneb was applied according to label directions showed no residual ETU (< 0.05 ppm) on the raw agricultural commodities, even in the presence of up to 4 ppm of maneb. Maneb residues were determined by the conventional CS_2 evolution method. ETU was measured by a gas chromatographic (GC) method based on the butyl derivative of ETU (reaction with bromobutane) and measurement by sulfur-sensitive flame-photometric detection. Average ETU recovery was 90% in the range of 0.05 to 0.2 ppm. (Author abstract reprinted by permission of the American Chemical Society)

77-1848. Matthews, E. D.; Faust, S. D. (Dep. Environ. Sci., Cook College, Rutgers Univ., New Brunswick, NJ 08903). **The hydrolysis of zectran in buffered and natural waters.** *J. Environ. Sci. Health* B12(2): 129-146; 1977. (15 references)

The rate of hydrolysis of Zectran (mexacarbate) in a phosphate buffered and in a naturally buffered system was evaluated. The two systems, having approximately the same pH values, appeared to be in reasonable agreement. This indicates that the same hydrolytic mechanisms in the pure system may also occur in the natural environment. In a sterile, naturally buffered system at 20 degrees Centigrade, Zectran disappeared at about the same rate as in a similar system with natural flora, indicating that hydrolysis is the predominant mode by which Zectran degrades. The rate of disappearance of Zectran is highly dependent on both the pH value and the temperature of the aqueous medium. At a low pH value, such as may be found in water originating from coniferous forests where Zectran has been applied, significant levels of this insecticide may persist for many weeks.

77-1849. Lockhart, W. L.; Metner, D. A.; Solomon, J. (Dep. Fish Environ., Fish. Mar. Serv., Freshwater Inst., Winnipeg, Manitoba, R3T 2N6, Canada). **Methoxychlor residue studies in caged and wild fish from the Athabasca River, Alberta, following a single application of blackfly larvicide.** *J. Fish. Res. Bd. Canada* 34(5): 626-632; 1977. (17 references)

On June 4, 1974, the Athabasca River was treated with methoxychlor for control of blackfly larvae. Pesticide was introduced into the water in a manner calculated to generate a 15-min pulse of treated water containing 300 μg methoxychlor. A preliminary experiment with rainbow trout (*Salmo gairdneri*) indicated that liver or kidney residues of methoxychlor would be suitable for monitoring likely times and places to expect toxic effects on fish in the river. Fish (*Salmo gairdneri, Catostomus commersoni, C. catostomus*, and *Hybopsis gracilis*) were caged in order to observe residues and mortality. Caged fish were not killed by methoxychlor, but they contained lower liver residues than wild fish of the same species captured near cages. Contaminated wild fish were found upstream of the treatment site after treatment. Residues were below detection limits by June 16. Residue measurements suggested that the most likely times to expect fish poisoning were the 2 wk following treatment, and that the most likely places were those river areas extending a few kilometers in both directions from the point of application. Evidence of fish movements and low pesticide residues in caged individuals reduced confidence in residue methods as monitoring tools. (Author abstract by permission)

77-1850. Kaiser, K. L. E. (Dep. Fish. Environ., Environ. Manage. Serv., Canada Cent. Inland Waters, Process Res. Div., Burlington, Ontario Canada L7R 4A6). **Organic contaminant residues in fishes from Nipigon Bay, Lake Superior.** *J. Fish. Res. Bd. Canada* 34(6): 850-855; 1977. (18 references)

Three species of fish, caught at various distances from a kraft pulp and paper mill effluent discharge in Nipigon Bay, were analyzed for organic contaminants. Fishes from all sites contained residues of polychlorinated biphenyls and DDE. Most samples were also contaminated with hexachlorobenzene and several samples contained phthalic acid esters. From sampling sites close to the mill discharge, dehydroabietic acid was observed in one extract of each of the three fish species investigated. Two isomers of tetrachlorobenzene and one trichlorobenzene isomer were identified in a longnose sucker (*Catostomus catostomus*) extract from the vicinity of the mill outfall. (Author abstract by permission)

77-1851. Misra, S. S.; Awasthi, M. D.; Dewan, R. S. (Div. Entomol., Ctr. Potato Res. Inst. Simla-171-001, India). **Residues of some contact soil insecticides in potatoes.** *J. Food Sci. Technol. (Mysore)* 14(1): 11-13; 1977. (12 references)

Insecticidal schedules involving application of aldrin dust, heptachlor dust, carbaryl (Sevin) bait, and chlorfenvinphos (Birlane) granules in the soil at 2.25, 1.25 and 4.0 kg active ingredient/ha, respectively, at planting time and separately at first earthing time for the control of cutworms, *Agrotis* spp., were evaluated in field experiments. It was observed from the data that excessive residues of aldrin, dieldrin, heptachlor and heptachlor epoxide persisted up to 151 days following the application of aldrin and heptachlor on/in raw whole, unboiled and unpeeled potatoes. Processing of potatoes could bring down the toxic residues of aldrin and dieldrin below the tolerance level in all the cases and from all the stages but not of heptachlor and heptachlor epoxide. Carbaryl and chlorfenvinphos seem to be safe insecticides as no detectable residues of these two insecticides could be found at

any stage in any case on/in processed as well as unprocessed potatoes. (Author abstract by permission)

77-1852. Nakamura, Y.; Ishikawa, K.; Kuwatsuka, S. (Sch. Soil Sci., Fac. Agric., Nagoya Univ., Nagoya, Aichi, Japan). **Degradation of benthiocarb in soils as affected by soil conditions. Studies on metabolism of benthiocarb. Part IV.** *J. Pestic. Sci.* 2(1): 7-16; 1977. (22 references)

The degradation of benthiocarb in laboratory soils was studied as affected by soil properties, moisture content or redox conditions, soil sterilization, repeated application, and combination with other herbicides. C-14-labeled benthiocarb was rapidly degraded under oxidative conditions, but slowly degraded under reductive conditions. Very small differences in the degradation rates were noted among different soils. Under oxidative conditions carbon dioxide was liberated massively with the degradation of benthiocarb. The degradation was greatly retarded by sterilizing the soils. The repeated application of benthiocarb, or its incorporation into the soil with simetryne, CNP, or propanil, and no significant effect on the degradation rate. While benthiocarb is applied in single formulations, it is also used in paddy fields in combination with simetryne and CNP as well as with propanil.

77-1853. Ishikawa, K.; Nakamura, Y.; Niki, Y.; Kuwatsuka, S. (Sch. Soil Sci., Fac. Agric., Nagoya Univ., Nagoya, Aichi, Japan). **Studies on the metabolism of benthiocarb. Photodegradation of benthiocarb herbicide. Part V.** *J. Pestic. Sci.* 2(1): 17-25; 1977. (15 references)

The photodegradation of benthiocarb in aqueous solution was studied by irradiation with ultraviolet light and sunlight. Benthiocarb in aqueous solution was more rapidly degraded by irradiation with u.v. light than were seven common pesticides tested, including 2-*sec*-butylphenyl *N*-methylcarbamate (BPMC), *S*-ethyl *N*,*N*-di-*n*-propylthiocarbamate, fenitrothion, *S*-benzyl diisopropyl phosphorothioate, propanil, simetryne, and methyl 3,4-dichlorocarbanilate. Irradiation produced many degradation products such as benthiocarb sulfoxide, desethyl benthiocarb, 4-chlorobenzyl alcohol, 4-chlorobenzaldehyde, 4-chlorobenzoic acid, 4-hydroxy analogues of the alcohol, the aldehyde and the acid, 8 other identified compounds, and about 20 unidentified ones. Among these, 4-chlorobenzaldehyde and the alcohol were the major products. The degradation in aqueous solution under sunlight was also rapid, and most of the products detected were the same as those produced by irradiation with u.v. light. Irradiation of a thin film of benthiocarb on glass plates also resulted in the same degradation products.

77-1854. Ishikawa, K.; Nakamura, Y.; Kuwatsuka, S. (Sch. of Soil Sci., Fac. Agric., Nagoya Univ., Nagoya, Aichi, Japan). **Volatilization of benthiocarb herbicide from aqueous solutions and soil.** *J. Pestic. Sci.* 2(12): 127-134; 1977. (17 references)

The volatilization of benthiocarb from its aqueous solution or from flooded and unflooded soils on exposure to sunlight and the identification of the volatilized substances are reported. Exposure of the solution of C-14-labeled benthiocarb to sunlight resulted in a marked decrease in radioactivity, which was about proportional to the decrease in the amount of water lost by evaporation. However, the presence of soil in the aqueous solution largely depressed the radioactivity loss. Volatilization of benthiocarb from unflooded soil was much less than from flooded soil. More than half of the radioactive substances volatilized from the aqueous solution exposed to the sun was composed of parent benthiocarb, while the rest consisted of volatile photodegradation products, including 4-chlorobenzaldehyde, formed under the experimental conditions used in this study.

77-1855. Johannsen, F. R.; Knowles, C. O. (Dep. Entomol., Univ. Missouri, Columbia, MO). **Distribution and metabolism of promecarb in corn following soil application.** *J. Pestic. Sci.* 2(2): 159-161; 1977. (4 references)

The distribution and metabolism of radiolabeled promecarb in corn was studied following application of the insecticide to the soil. The carbamate was applied to the top one inch of soil and corn seeds were then planted. Analysis of corn plants at 15, 30, 45, 60, and 90 days after planting indicated that the radioactive material was absorbed by the roots and was present in the stems and leaves. The compound was metabolized during the 90-day test period. The parent compound, promecarb, decreased from 43.5% of the organosoluble radioactivity at 15 days to 3.7% by 90 days.

77-1856. Matsui, M.; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). [**Residue determination of dicofol and chlorthiamid in soil under various test conditions.**] *J. Pestic. Sci.* 2(2): 169-172; 1977. (5 references) (Japanese)

Studies were conducted in relation to in vitro pesticide residue determinations, adding factors such as vaporization, which was neglected in the conventional method carried out in a closed system. Dicofol and chlorthiamid (2,6-dichlorothiobenzamide), separately mixed with soil or placed on the surface of soil was kept in vessels with open or closed lid. The vessels were kept in a temperature controlled room or in the open air. The results showed that while dicofol did not evaporate from soil under any conditions and had a half life of about 300 days due to degradation, chlorthiamid gradually disappeared by evaporation from the open lidded vessel with a half life of about 30 days but did not disappear from the closed vessels.

77-1857. Environment Agency (Prime Minister's Office, Japanese Government, Tokyo, Japan). [**The status quo of environmental pollution due to agricultural chemicals and its countermeasures.**] *Kankyo Hakusho (Environment White Paper)* 52: 261-264; 1977. (Japanese)

Bans were successively imposed on organomercurial fungicides, 2,4,5-T, DDT, TEPP, methyl parathion, parathion, BHC, and heptachlor between 1968 and 1973. The application of lead arsenate, endrin, dieldrin, aldrin, telodrin, benzopine, and PCP was restricted after 1971. Thereafter residues of BHC, DDT, and dieldrin in agricultural crops have declined to undetectable levels, contamination of arable lands by BHC, DDT, and dieldrin has not become a problem, and DDT derivatives and BHC isomers were not detected in rivers in 1974. However, such residues are still detected in river bottom mud and fish, even though in minute amounts. BHC, DDT, and dieldrin were detected in wild birds captured between 1972 and 1974 in the Inland Sea of Japan. These facts show that the problem of organochlorine pesticide residues has not been completely resolved. Countermeasures include withholding the registration of newly submitted pesticides in case of chemicals suspected of causing environmental (soil, water, and crop) pollution and fish toxicity, limiting the pesticide residues in crops according to the standard for 33 pesticides of the Ministry of Health and 65 pesticides of the Environment Agency, indicating the conditions of pesticide application by the Ministry of Agriculture and Forestry, and guiding the manufacturers to commercialize less toxic pesticides.

77-1858. Ueda, M. (Kochi Prefect. Inst. Pub. Health, Kochi, Kochi, Japan). [**Contamination of foods by chemical substances: Pesticide residues in foods.**] *Koshu Eisei (J. Publ. Health Practice)* 41(6): 397-403; 1977. (31 references) (Japanese)

Changes in chemical contamination of foods with time were described, centering around the pesticide residues in foods. First, the mercury content of rice was reduced in 1972 to the level of the time when mercurial pesticides were not used, because of the 1958 ban. The high mercury content of Japanese hair is probably due to their eating large amounts of fish. Whereas the reduction of BHC in beef, cow's milk, pork, and chicken and in the environment was relatively satisfactory since the 1969 ban, the reduction in mother's milk is not so satisfactory. The content of DDT in pork and chicken was not reduced so satisfactorily as in beef and cow's milk, probably because of the contamination of feed for pigs and poultry. This idea is substantiated by the fact that the DDT content of such feed was about the same as in pork, chicken, and hen's eggs. The content of dieldrin in foods such as beef, cow's milk, pork, chicken, and mother's milk is decreasing according to a trend, supposedly due to interaction with DDT in the body. Considering that animal and poultry feed is almost all imported from abroad, it is important to ask the cooperation of feed supplying countries.

77-1859. Baba, K.; Yamaguchi, M.; Chikaraoka, Y. (Sec. Hyg. Chem., Dep. Environ. Sci., Nagasaki, Prefect. Inst. Pub. Health Environ. Sci., Nagasaki, Nagasaki, Japan). [**Organochlorine compounds (pesticide residues and PCB) in milk and blood of puerperal women.**] *Nagasaki-Ken Eisei Kogai Kenkyusho Ho (Annu. Rep. Nagasaki Pref. Inst. Publ. Health Environ. Sci.)* 15: 135-141; 1975. (4 references) (Japanese)

Total DDT, total BHC, polychlorocyclodienes and PCB were determined as usual (studies carried out since 1971) in milk and in blood (PCB only) of puerperal women from 6 areas of Nagasaki Prefecture. In 1975 total DDT in the milk ranged from 0.010 to 0.189 ppm (fat basis), averaging 0.062 ppm, slightly larger than those found in January 1971 (0.038 ppm) and December 1971 (0.032 ppm), and about the same as that the country as a whole (0.068 ppm). Total BHC in milk ranged from 0.009 to 0.251 ppm (fat basis), averaging 0.093 ppm, less than that in January 1971 (0.164 ppm) and a little larger than that country-wide (0.083 ppm); dieldrin was found in all samples, although very low (0 - 0.004 ppm, average 0.001 ppm, fat basis).

77-1860. Kuwano, K.; Yamaguchi, M.; Kawaguchi, Y.; Baba, K.; Ueda, T.; Nishikawa, M. (Sch. Hyg. Chem., Dept. Environ. Sci., Nagasaki Pref. Inst. Public Health Environ. Sci., Nagasaki, Nagasaki, Japan). [**Time change of organochlorine pesticide residues in commercial cow's milk.**] *Nagasaki-Ken Eisei Kogai Kenkyusho Ho (Annu. Rep. Nagasaki Prefect. Inst. Public Health Environ. Sci.)* 15: 128-131; 1975. (2 references) (Japanese)

Results of determinations of organochlorine pesticide residues in commercial cow's milk obtained from one dairy in Nagasaki Prefecture were reported. The results for α-BHC were: 14.9 ± 1.7 ppb, 9.5 ± 1.5, 3.2 ± 0.6, 3.6 ± 0.6, and 1.8 ± 0.3 ppb (fat basis) respectively in 1971, 1972, 1973, 1974 and 1975. The corresponding values for β-BHC were 78.0, 57.9, 12.0, 8.7, and 6.9 ppb. Those for γ-BHC were 1.0, 1.8, 0, 1.4, and 1.3 ppb. The total BHC was 95.3 ± 2.5 in the above years. The corresponding values for total DDT were 5.0, 4.2, 1.0, 6.0 and 1.6 ppm, respectively. Those for dieldrin were 2.0, 5.0, 0, 1.0 and 1.0 ppb. The range of fat content of the milk was 3.16 - 3.24 percent. As was seen, there was a marked decrease in these residues from 1971 to 1975, clearly indicating an effect of the banning of DDT, BHC and dieldrin beginning in 1960.

77-1861. Yamaguchi, M.; Kuwano, K.; Kawaguchi, Y. (Sect. Hyg. Chem., Dep. Environ. Sci., Nagasaki Prefect. Inst. Publ. Health Environ. Sci., Nagasaki, Japan). [**Pesticide residues in foods. Part 6.**] *Nagasaki-Ken Eisei Kogai Kenkyusho Ho (Annu. Rep. Nagasaki Prefect. Inst. Publ. Health Environ. Sci.)* 15: 126-127; 1975. (Japanese)

Pesticide residues for which national standards were established in watermelons, melons, pickling melons, eggplants, tomatoes, cucumbers, tea, and potatoes

were determined in 1975 on 59 samples. The only residue detected was BHC at levels from 0 to 0.04 ppm (total BHC); no other pesticide could be detected. Pesticide residues detected in 9 samples of commercial cow's milk in 1975 were BHC, DDT, dieldrin and heptachlor; the average values were 0.002, 0.007, 0.001, 0, 0.010, 0. 0.001, 0, 0.002 ppm, and 0, respectively for α-, β-, γ-, Δ-, and total BHC *p,p'*-DDT, *p,p'*-DDD, total DDT, dieldrin, and heptachlor. Although dieldrin was detected in 8 of a total of 9 samples, the value was fairly low. These data showed no significant difference from those found since 1973.

77-1862. Kawaguchi, Y.; Yamaguchi, M.; Baba, K.; Kurihara, S.; Honda, K. (Sec. Hygienic Chem., Dept. Environ. Sci., Nagasaki Fref. Inst. Publ. Health and Environ. Sci. Nagasaki, Nagasaki). [**Analytical results of heavy metal content of foods. Part 1.**] *Nagasaki-Ken Eisei Kogai Kenkyusho Ho (Annu. Rep. Nagasaki Prefect. Inst. Publ. Health Environ. Sci.)* 15: 121-125; 1975. (3 references) (Japanese)

Results of determinations in 1975 on the contents of heavy metals such as As, Fe, Pb, Mn, Cd, Cu, Zn, Se in 11 kinds of agricultural products, chicken, and 6 kinds of sea foods collected in 5 non-polluted areas in Nagasaki Prefecture were reported. Arsenic was not detected in vegetables and was detected at less than 0.05 ppm in rice and chicken; it was detected at 1-2 ppm in sea foods. The lead content was generally low, being less than 0.1 ppm in all foods. Zinc was widely distributed in plants and animals; the contents were 6.3 ppm in spinach, 4.7 ppm in Welsh onion, 0.6 ppm in fruits, higher in rice at 23.4 ppm, 16.9 ppm in chicken, and about 10 ppm in fish. The number of samples was 5-6. Generally speaking, leafy vegetables contained more heavy metals than did fruit and root vegetables. The relatively high contents of Mn, Cu, and Zn were not considered abnormal compared to references.

77-1863. Yamada, T. Sugiyama, S.; Noda, H.; Mitsukuni, Y.; Yoshimura, M. (Sch. Legal Med., Kinki Univ., Osaka, Japan). [**Forensic medical studies on pesticide residues in human body. Part 1. Benzene hexachloride.**] *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 29(6): 416-426; 1976. (12 references) (Japanese)

The concentration of total BHC (comprising α-, β-, γ-, and δ-, isomers) was determined in 126 subcutaneous adipose tissue specimens and 62 livers obtained from legally autopsied human cadavers during one year from April 1974. The total BHC in subcutaneous adipose tissue averaged 4.26 (less than 1 year old), 4.95 (ages 1-19), 8.45 (ages 20-49), and 7.46 ppb (age over 50), with respective maxima of 17.75, 15.74, 22.50 and 15.90 ppm and respective minima of 0.34, 0.72, 1.51, and 2.23 ppm. From 97 to 99% of the total BHC was the β-isomer, with small amounts of other isomers. The average BHC content in male adipose tissues was 8.43 (max. 17.96 and min. 151) and that in female adipose tissue was 7.70 (max. 22.50 and min. 2.51 ppm). Total BHC in the liver adipose tissue was 8.43 (max. 17.96 and min. 1.51) and that in female adipose tissue was 7.70 (max. 22.50 and min. 2.51 ppm). Total BHC in the liver averaged 3.12 (less than 1 year old), 3.41 (ages 1-19), 6.19 (ages 20-49), and 4.24 ppm (age over 50), with respective maxima and minima of 8.88, 7.82, 13.55, and 7.65, and 0.53, 1.12, 1.14, and 1.32 ppm. Four 97 to 99% of the total BHC was the β-isomer, with small amounts of other isomers. No difference in total BHC content was found between males' livers and females' livers. Translocation of BHC from mother to fetus via the placenta was demonstrated.

77-1864. Nagakura, E. (Tokai Regional Fish. Res. Lab. Tokai, Japan). [**Fish and shellfish pollution.**] *Rodo Kagaku (Sci. Labor)* 32(6): 22-26; 1977. (Japanese)

The General situation of fish and shellfish pollution was described; the pollutants were heavy metals which cause public nuisance such as Hg, Se, Pb, Cd, Cr, Mn, Co, Ni, Cu, Zn, Fe, and Bi, especially Hg, PCB and organochlorine pesticides. According to the off licialized analytical results from 1969 to 1973, DDT (including DDE and DDD) and BHC were detected in all 101 samples of fish in sea water and fresh water. DDT contents of 0.002-0.15 ppm were found in the former and 0.014 - 0.87 in the latter, and BHC contents were 0.009n- 0.79 and 0.004 - 0.21 ppm respectively. In the bottom mud of Ariake Bay, BHC was present at less than 0.01 ppm (limit of detection). Although DDT, BHC and some pesticides were banned, other pesticides such as organophosphorus and carbamate pesticides and several herbicides exert some effects as pollutants of fish and shellfish. The problem of combined pollution has not yet been resolved. The high sensitivity of the larvae of crustaceans was discussed for use in protection of fisheries in the future.

77-1865. Mori, Z.; Tamura, J. (Wakayama Res. Lab., Kao Soap Co., Ltd., Wakayama, Japan). [**Studies on removal of pesticide residues from fruits and vegetables. Part II. Application of a combined detergent consisting of sugar fatty acid ester and potassium pyrophosphate on fruits and vegetables.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(3): 217-224; 1977. (19 references) (Japanese)

The effectiveness of detergent A, comprising 5% sucrose oleate, 20% potassium pyrophosphate, 45 orthophosphoric acid, and 71% water, was compared with those of a neutral detergent comprising 10% straight chain sodium alkyl benzensulfonate, 10% sodium polyoxyethylenalkyl ether sulfate, and 80% water, and with pure water for removing pesticide residues on fruits and vegetables. Detergent A was the most effective for removing copper, arsenic, and lead from vegetables and fruits other than tomato. Against organophosphorus pesticide residues, detergent A was equal or slightly inferior to neutral detergent; however, it was far more effective than water washing. The effectiveness of detergent B, which

has sodium maleate as a builder, was inferior to detergent A. The presence of sodium chloride during washing did not interfere with the removal effectiveness of detergent A aginst copper. In the case of removing residual copper from apples, the effectiveness increased as the pH was reduced; however, removal of residual arsenic was most effective under both higher acidic and basic conditions, and was most ineffective under neutral conditions.

77-1866. Bypass, J. B.; Lake, J. R. (Natl. Inst. Agric. Eng., Wrest Park, Silsoe, Beford, England). **Spray drift from a tractor-powered field sprayer.** *Pestic. Sci.* 8(2): 117-126; 1977. (9 references)

Amounts of spray drifting downwind from a field sprayer applying picloram or paraquat were determined and compared with the damage done to bean and barley plants. Measurements downwind of a stationary spray-boom showed that drift increases rapidly with both wind speed and boom height. It was concluded that it is possible to set a safe distance downwind for the application of a herbicide which affects plants only in the wetted areas but with a sensitive crop and many growth-regulating materials this will be very difficult. (Author abstract by permission)

77-1867. Smelt, J. H.; Leistra, M.; Voerman, S. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Movement and rate of decomposition of ethoprophos in soil columns under field conditions.** *Pestic. Sci.* 8(2): 147-151; 1977. (9 references)

The rates of degradation and downward movement of ethoprophos (*O*-ethyl*S*,*S*-dipropyl phosphorodithioate) were measured under field conditions in four soils in aluminum columns (40 cm long). A 10% granular formulation was incorporated in the top 10 cm at a rate of 10.0-10.5 kg a.i./ha. Under outdoor conditions during spring and summer, loss of ethoprophos corresponded approximately to first order kinetics; the half-life was about 87 days in a humic sand and a peaty sand, with pH values of 4.5 and 4.6, respectively. In a sandy loam and a loam soil with pH values of 7.2 and 7.3, respectively, the half-life ranged between 14 and 28 days. Under experimental conditions with fallow soils and 35.3 cm rainfall, the downward movement of substantial concentrations of ethoprophos by leaching and diffusion was restricted to a few centimeters. (Author abstract by permission)

77-1868. Johnson, H. P.; Baker, J. L. (Iowa State Water Resour. Res. Inst., Ames, IA). **Movement of herbicides in soil by mass flow.** *Natl. Tech. Inform. Serv.* PB-248, 455, 1975, 49 p.

The dominant factors in the movement of selected herbicides in soil by mass flow under unsaturated conditions are temperature, percent moisture differences, soil type, and at higher temperatures, soil density. Both increasing temperature and increasing moisture differences increased movement by what was believed to be mass flow. Soil type, by affecting the degree of herbicide adsorption, affected movement by mass flow. The higher porosity at lower density and thus greater vapor phase movement is believed responsible for higher diffusion coefficients for 0 and 2% differences at 43.3 degrees. The time of diffusion had no measurable effect on the rate of movement. Of the three herbicides studied at 1.3 g/cm^3 bulk soil density, only the diffusion rate for alachlor was measurably affected by the simultaneous movement of water. For both atrazine and cyanazine, movement was moisture independent. At 0.9 g/cm^3 the diffusion rate for alachlor, and at 43.3C, for atrazine, was affected by the simultaneous movement of water. No measurements were made of cyanazine at 0.9 g/cm^3. (Author abstract by permission)

77-1869. Stewart, B. A.; Wollhiser, D. A.; Wischmeier, W. H.; Caro, J. H.; Frere, M. H. (Agric. Res. Serv., Hyattsville, MD). **Control of water pollution from cropland. Volume I. A manual for guideline development.** *Natl. Tech. Inform. Serv.* PB-249,517, 1975, 118 p.

Engineering and agronomic techniques to control sediment, nutrient, and pesticide losses from cropland were identified, described, and evaluated. Methodology was developed to enable a user to identify the potential sources of pollutants, select a list of appropriate demonstrated controls, and perform economic analyses for final selection of controls. The information is presented in the form of regional maps, decision flow charts, tables, and brief technical highlights. (Author abstract by permission)

77-1870. Bartley, T. R.; Hattrup, A. R. (Engineering Res. Ctr., Bureau of Reclamation, Denver, CO). **Acrolein residues in irrigation water and effects on rainbow trout.** *Natl. Tech. Inform. Serv.* PB-249,933, 1975, 19 p.

Studies were conducted on the Columbia Basin Project, Washington, to determine the concentrations of acrolein in irrigation water at several sampling stations during 20 applications of the herbicide for aquatic weed control and at the Bureau's Carter Lake, Colorado Auqatic Weed Test Station to find out the effects of simulated acrolein treatment on rainbow trout. Analysis of samples of treated irrigation water shows that the actual acrolein concentrations near application sites agree with the computed levels and that the concentrations decline gradually as the treated water moves downstream. (Author abstract by permission)

77-1871. Donigian, A. S., Jr.; Crawford, N. H. (Hydrocomp. Inc., Palo Alto, CA). **Modeling pesticides and nutrients on agricultural lands.** *Natl. Tech. Inform. Serv.* PB-250,566, 1976, 332 p.

Modifications, testing, and further development of the Pesticide Transport and Runoff (PTR) Model have produced the Agricultural Runoff Management (ARM)

Model. The ARM Model simulates runoff, snow accumulation and melt, sediment loss, pesticide-soil interactions, and soil nutrient transformations on small agricultural watersheds. The report discusses the major modifications to and differences between the PTR and ARM Models. Instrumented watersheds in Georgia provided data for testing and refinement of the runoff, sediment and pesticide portions of the ARM Model. Comparison of simulated and recorded values indicated good agreement for runoff and sediment loss, and fair to good agreement for pesticide loss. Pesticides transported only by sediment particles were simulated considerably better than pesticides that move both in solution and on sediment. A sensitivity analysis of the ARM Model parameters demonstrated that soil moisture and infiltration, land surface sediment transport, pesticide-soil interactions, and pesticide degradation are the critical mechanisms in simulating pesticide loss from agricultural watersheds. (Author abstract by permission)

77-1872. Conrad, B. (Tierhyg. Inst., Freiburg, Germany). **Zur Belastung der Vogelwelt der Bundesrepublik mit chlorierten Kohlenwasserstoffen und PCB. [Chlorinated hydrocarbons and PCB in West German birds.]** *Naturwissenschaften* 64(1): 43-44; 1977. (2 references) (German)

A total of 557 eggs from 19 native bird species were examined by gas chromatography for chlorinated hydrocarbons at the Animal Hygiene Institute of Freiburg in 1974-1976. All eggs contained HCB, dry weight basis (0.10-258.0 ppm), *p,p'*-DDE (0.33-490.0 ppm), and PCB (2.0-847.0 ppm); 99.3% of the samples contained heptachlor epoxide (0.06-26.1 ppm), 56% contained heptachlor (0.06-02.8 ppm), 47.2% contained aldrin (0.05-2.3 ppm), and 43.5% contained dieldrin (0.05-16.0 ppm). Eggshell thinning was statistically confirmed in five species. HCB levels in eggs were highest in grain-growing areas, while DDE contamination was maximal in areas producing fruit, vegetables, and wine grapes. PCB contamination was most prevalent in eggs from industrial areas such as the Ruhr and Nurnberg.

77-1873. Kurtz, D. A.; Kim, K. C. (Pestic. Res. Lab., Pennsylvania State Univ., University Park, PA 16802). **Chlorinated hydrocarbon and PCB residues in tissues and lice of northern fur seals, 1972.** *Pestic. Monit. J.* 10(3): 79-83; 1977. (27 references)

DDT, dieldrin and PCB contents of tissues and the sucking lice of the northern fur seal (*Callorhinus ursinus*) were studied in samples collected in July 1972 in the Pribilof Islands, Alaska. They included the analyses of two nursing cows and their two newborn pups, three 2-month-old pups, and the sucking lice inhabiting these animals, *Antarctophthirus callorhini* and *Proechinophthirus fluctus*. The ΣDDT content of fat tissue was 5.2, 5.6, and 63 μg/g for cows, newborns, and 2-month-old pups, respectively. Dieldrin appeared at trace levels. PCB residues (Aroclor 1254) were 5.8, 5.5, and 33 μg/g respectively. The ΣDDT content of blood was less than 0.01 μg/g for cows and newborns and 4.6 μg/g for 2-month-old pups. PCB's were found only in trace amounts in the blood of all animals except one 2-month-old pup which contained 3.4 μg/g. Lice contained 0.2-6 percent, respectively, of the ΣDDT and PCB's detected. All residues were expressed on a wet-weight basis. Two-month-old pups had far higher residue levels than had cows. A high percentage of ΣDDT occurred as the DDE metabolite: 60 percent in cows and newborn pups and 90 percent in 2-month-old pups. (Author abstract by permission)

77-1874. Marion, W. R. (Wildl. Ecol. Progr., Sch. Forest Resour. Conserv., Univ. Florida, Gainesville, FL 32611). **Organochlorine pesticide residues in plain chachalacas from South Texas, 1971-72.** *Pestic. Monit. J.* 10(3): 84-86; 1976. (10 references)

Plain chachalacas (*Ortalis vetula*) from the intensively cultivated and sprayed Lower Rio Grande Valley of Texas were analyzed for pesticide residues during 1971 and 1972. Residues of eight organochlorine pesticides and a polychlorinted biphenyl were identified in fat tissues of specimens collected from four study areas. Chemicals detected in all 24 birds and average residues (±SD) in ppm wet weight were: DDT (1.52±4.12), DDE (2.48±2.09), dieldrin (0.23±0.59), endrin (0.13±0.52), and Aroclor 1248 (0.17±0.20). Residue levels varied considerably, but the majority of the fat tissues contained significantly less than 1 ppm of these chemicals. Because birds of this species feed primarily on unsprayed native fruits rather than on sprayed crops, they absorb very few pesticides through their diet. Although birds from exposed areas near cultivated fields had generally higher residues than had birds from less exposed areas, these herbivores generally had much lower residues than would most birds living near heavily treated lands. During the present study there was no evidence that plain chachalacas died as a direct result of exposure to agricultural chemicals, nor was there evidence that eggshells of this species have thinned significantly since 1900. (Author abstract by permission)

77-1875. Miles, J. R. W. (Res. Inst., Agric. Canada, London, Ontario, Canada N6A 5B7). **Insecticide residues on stream sediments in Ontario, Canada.** *Pestic. Monit. J.* 10(3): 87-91; 1977. (12 references)

Insecticide residues on suspended and bottom sediments of streams of Ontario, Canada, have been studied in a tobacco-growing and a vegetable muck area. The proportion of TDE to DDT was < 1 in water and > 1 in bottom sediments. The ratio of TDE to DDT in bottom material increased linearly from the contamination point at stream source to the mouth of Big Creek in Norfolk County, Ontario. Bed load samples contained three to six times greater concentrations of insecticides than bottom mate-

rial. Adsorption of insecticides on suspended sediment decreased in order DDT > TDE > dieldrin > diazinon, which is consistent with the water solubility of these compounds. (Author abstract by permission)

77-1876. Neidermyer, W. J.; Hickey, J. J. (Dep. Wildl. Ecol., Univ. Wisconsin, Madison, WI 53706). **Chronology of organochlorine compounds in Lake Michigan fish, 1929-66.** *Pestic. Monit. J.* 10(3): 92-95; 1977. (10 references)

Museum specimens of six species of Lake Michigan fish collected from 1929 through 1966 were analyzed for dieldrin, polychlorinated biphenyls (PCB's), and DDT analogs. Dieldrin first appeared in the 1955 specimens. Residues were low and exhibited no trend with time. PCB's and DDT analogs appeared in 1949 in the same samples. Both PCB's and EDDT increased progressively through 1965. PCB residues showed no decreasing trend. EDDT peaked in 1965. PCB's and DDE were always detected together. The ratio of PCB to DDT showed no trend from 1949 to 1966. (Author abstract by permission)

77-1877. Paz, J. D. (351 W. 84th St., New York, NY 10024). **Preliminary study of the occurrence and distribution of DDT residues in the Jordan watershed, 1971.** *Pestic. Monit. J.* 10(3): 96-100; 1976. (10 references)

Data obtained from the Jordan watershed in 1971 revealed the presence of DDT and its metabolites at various levels along the food chain. Detectable levels of EDDT in water of the Jordan River and two fish ponds ranged from 0.019 to 0.500 ppb, which is 1/10 to 1/500 the maximum level permitted in water by the U.S. Government. Mean residue in phytoplankton was 0.906 μg/g; in zooplankton the mean was 6.49 μg/g. EDDT residue in fish of the Jordan watershed averaged 0.37 mg/kg in carp, 2.59 mg/kg in benith, and 3.34 mg/kg in sardines. (Author abstract by permission)

77-1878. Truhlar, J. F.; Reed, L. A. (U. S. Geol. Survey, Box 1107, Harrisburg, PA). **Occurrence of pesticide residues in four streams draining different land-use areas in Pennsylvania, 1969-71.** *Pestic. Monit. J.* 10(3): 101-110; 1977. (8 references)

Samples of water, streambed material, fish, and soil were collected in four small drainage basins in Pennsylvania in 1969-71 and analyzed to determine the concentrations of chlorinated hydrocarbon insecticides. Water samples were also analyzed for phenoxy-acid herbicides. Each basin studied represents a predominant land use: forest, general farms, residential areas, and orchards. All water and fish samples showed pesticide concentrations less than the maximum level recommended by the Public Health Service, U.S. Department of Health, Education, and Welfare. However, no fish were found in the orchard stream. DDT or one of its metabolites was the most frequently occurring insecticide and was detected in all media samples except the forest soil. The highest combined concentration of DDT and its metabolites in storm-runoff samples was 11.4 μg/liter in a sample collected from the residential area stream, but the median was higher (0.12 μg/liter) in the orchard than in the residential areas (0.02 μg/liter). A samples of the top 0.5 inch (13 mm) of orchard soil contained 40,000 μg/kg DDT and its metabolites, even though DDT had not been used in the orchards for several years prior to this study. Maximum concentrations detected in other orchard media are 330 μg/kg in streambed material and 3.45 μg/kg in storm runoff. Dieldrin was the second most frequently occurring insecticide. Other insecticides detected were chlordane, heptachlor epoxide, lindane, and a trace of aldrin in one fish sample. Each stream contained at least one of the following herbicides: 2,4-D, silvex, or 2,4,5-T. (Author abstract by permission)

77-1879. Gowen, J. A.; Wiersma, G. B.; Tai, H. (Ecol. Monit. Br., Off. Pesticide Programs, Environ. Protect. Ag., Washington, DC 20460). **Mercury and 2,4-D levels in wheat and soils from sixteen states, 1969.** *Pestic. Monit. J.* 10(3): 111-113; 1976. (3 references)

Mercury and 2,4-D levels were determined for soil and wheat from 16 States. Mercury was detected in all samples; 2,4-D was found in eight percent of the soil samples and six percent of the wheat samples analyzed. (Author abstract by permission)

77-1880. Gowen, J. A.; Wiersma, G. B.; Tai, H.; Mitchell, W. G. (Ecol. Monit. Br., Off. Pesticide Programs, Environ. Protect. Ag., Washington, DC 20460). **Pesticide levels in hay and soils from nine states, 1971.** *Pestic. Monit. J.* 10(3): 114-116; 1976. (11 references)

In 1971 hay and soil samples were collected in 9 States to determine the incidence and levels of pesticide residues in hayfields. Residues were detected in 8 percent of the soil samples and 29 percent of the hay samples. DDT and its metabolites, DDE and TDE, were contained in 2 soil samples and 21 hay samples. Heptachlor epoxide and chlordane were detected in 1 soil sample, dieldrin in 5 soil samples, and diazinon in 4 hay samples. (Author abstract by permission)

77-1881. Syrowatka, T.; Palut, D.; Gorski, T. (Dep. Toxicol. Sanit., Nat. Inst. Hyg., Warsaw, Poland). **Pozostalosci weglowodorow chlorowanych we krwi mieszkancow Warszawy i okolic w okresie 1975/76.** [**Chlorinated hydrocarbon residues in the blood of the population of Warsaw and its environs, 1975/76.**] *Roczn. Panstw. Zakl. Hig.* 28(1): 93-98; 1977. (4 references) (Polish)

Levels of *p,p'*-DDT and its metabolites and other organochlorine compounds were determined in whole blood collected from men in and around Warsaw between January 1975 and March 1976. All blood samples analyzed contained *p,p'*-DDE, while only some contained *p,p'*-DDT, *p,p'*-DDD, and γ-BHC. None of the biological materials analyzed contained α- and β-BHC, methoxychlor, or

HCB. The gradual withdrawal of DDT from use for plant protection had no effect on its overall levels in human blood as yet. Mean total DDT levels for a five year period beginning in 1969 were 32.2, 25.8, 51.9, 38.5, 30.0, and 33.0, μg/l and in 1975/76 the value was 30.8 μg/l. Replacement of DDT by other persistent insecticides such as lindane resulted in increased occurrence of blood samples with elevated levels of these compounds.

77-1882. Babiker, A. G. T.; Duncan, H. J. (Dept. Chem., Univ. Glasgow, Glasgow, Scotland). **Influence of soil depth on asulam adsorption and degradation.** *Soil Biol. Biochem.* 9(3): 197-201; 1977. (34 references)

A comparison was made of the adsorption and degradation of asulam using soil samples collected from two profiles. The effect of sand, yeast extract and other materials on asulam disappearance was included in the study. Asulam was not adsorbed to any marked extent by soils examined above the pH range of 4.5 to 6.0. The adsorption which does take place is inversely correlated with pH. Comparatively higher amounts of asulam are retained by topsoil samples than by their respective subsoil samples. Asulam degradation is rapid in topsoils and slow in subsoils. The addition of yeast extract to the latter enhanced degradation. The sensitivity of the analytical procedure was improved by extracting the Bratton-Marshall color into *n*-butanol.

77-1883. Laplanche, A.; Martin, C.; Richard, Y. (Ecole Nat. Super. Chim., Rennes, France). **Etude de la cinetique de l'ozonation des pesticides organo-phosphores. Exemple du parathion. [Studies of ozonization kinetics of organophosphate pesticides. Example: parathion.]** *Tech. Sci. Munic.* 71(4): 169-173; 1976. (8 references) (French)

Two methods currently proposed for reducing the levels of trace contaminants in waste water include adsorption on activated carbon and chemical oxidation with ozone. A pilot ozonization tower was constructed to study different ozonization parameters. The kinetics and reaction order were examined. Ozone was bubbled through a buffered aqueous parathion solution, and the ozone dissolved in the water as well as the residual parathion were determined after various contact times. A plot of the results indicated that the reaction was first order with respect to parathion. The action of ozone at the interface between the air bubble and the water was negligible compared to the action of the ozone dissolved in the water. For a given pH and temperature and a given degree of contamination the most rapid degradation will be achieved with the highest ozone concentration. The results were useful in column design.

See also **77-1901** **77-1923**

77-1884. Anonymous. **Good news for beekeepers.** *Agric. Res.* 16-17; 1977.

In an effort to avoid the usual injuries occurring to bees living near crops sprayed with insecticides, studies of several suggested treatments were made at a 480 acre planting of cotton. The most effective method to shield the bees from the harmful effects of the sprays involved the following 6-way combination which included burlap covering, pollen feeding, shade, top waterer, bottom board, and sirup feeding. Burlap covering confines the bees to the hive for 12 hours after the insecticide application. During this time the pollen and water sustain the bees. The shade kept them out of the hot Arizona sun, and the bottom board, which gives bees additional room at the bottom of the hive, provides a clustering space for field bees at night and during heat waves or confinement when they cannot fly.

77-1885. Johnson, C. J. (Jefferson County Health Dep., Lakewood, CO 80226). **Toxic soluble waste disposal in a sanitary landfill site draining to an urban water supply.** *Am. J. Public Health* 67(5): 468-469; 1977. (8 references)

Various problems connected with the disposal of very large amounts of hazardous substances were brought to light when 6,000 pounds of "ineffective rat bait" was buried at a sanitary landfill site on November 6, 1974 in Jefferson Country, Colorado. The agent in the bait, sodium monofluoroacetate (MFA), is one of the most toxic non-protein substances known. Due to its extreme toxicity, the safety of burying such a large amount of the substance in this particular spot was investigated. An intermittent stream was found running by the disposal site and within a mile downstream there were eight homes on wells. The stream continued, draining into a reservoir for a large water district. Although there were some quantities of clay in the area of disposal, there were also upturned strata of permeable sandstone which was part of the Laramie-Fox Hills sandstone formation and served as a water recharging site for an important aquifer running under Denver. The rat bait was removed and other means for its disposal were found. It is stressed that better guidelines are needed for the disposal of such materials.

77-1886. doPico, G. A.; Reddan, W.; Flaherty, D.; Tsiatis, A.; Peters, M. E.; Rao, P.; Rankin, J. (Dep. Med., Univ. Wisconsin Cent. Health Sci., Madison, WI). **Respiratory abnormalities among grain handlers. A clinical, physiologic, and immunologic study.** *Am. Rev. Resp. Dis.* 115(6): 915-927; 1977. (36 references)

A survey of 300 grain elevator workers showed that 77% complained of eye symptoms; 64% of nasal symptoms; and 88% of one or more respiratory symptoms on exposure to airborne grain dust. Symptoms on exposure were independent of age and length of employment. Cough and wheezing on exposure were more common among smokers than nonsmokers. Of the workers, 19% had had episodes of grain fever. The prevalence of chronic bronchitis was 37% (42% of smokers and 30% of nonsmokers). Wheezes on auscultation occurred in 23%. Lung ventilatory function, as well as diffusion capacity, correlated significantly with age and smoking habits, but not with length of employment. Of the workers, 37% had an abnormal mean forced expiratory flow during the middle half of the forced vital capacity, and 34% had an abnormal maximal expiratory flow after exhalation of 50% of the forced vital capacity, whereas only 13% had an abnormal ratio of 1 sec forced expiratory volume to forced vital capacity. There was no correlation between precipitins to fungi, bacteria, grain, or grain dust antigens and acute or chronic respiratory symptoms, lung function, or grain fever. However, there was a significant correlation between cutaneous reactivity to grain dust and wheezing on exposure. Abnormal flows at low lung volumes were more common among cutaneous reactors to common allergens. It is concluded that exposure to airborne grain dust can cause acute inflammatory reaction on the exposed mucosa, and it is highly probable that grain dust contributes and, in some causes, causes chronic airway disease.

77-1887. Vale, J. A. (Guy's Hosp. Poisons Unit, New Cross Hosp., London, England). **The immediate care of cases of poisoning.** *Anaesthesia* 32(5): 483-493; 1977. (6 references)

The immediate management of poisoned patients is discussed with regard to supportive and specific treatment. Specific information as to the incidence, toxicology, and management of cases of paraquat poisoning is given. In the 10 years following the introduction of this herbicide, 44 deaths were recorded in the United Kingdom, one-third of which were thought to have occurred accidentally. At least 70 deaths from paraquat poisoning were reported in the United Kingdom in the 11th and 12th years (1974 and 1975) that this chemical has been available. In these later years most of the deaths are from suicide rather than accidental. The lethal dose appears to be as little as 10 ml. Pulmonary edema and hemorrhage accompany death after ingestion of large quantities of the substance. The liver, kidney and heart are also damaged. When a patient has taken a smaller dose, death may not result for 6 weeks. Management involves the elimination of the herbicide from the gut before absorption has taken place and the elimination of paraquat from the body after its absorption. Removal can be attempted by gastric lavage, or Fullers' earth treatment. Oxygen is contraindicated. Antidotes are not effective. Methods to increase the elimination of paraquat from the body such as forced diuresis and dialysis have been disappointing in their effectiveness, particularly when the paraquat concentrate has been ingested. Even hemoperfusion has not been successful in treating patients who have ingested large amounts of paraquat. However, it is felt that hemoperfusion may have a therapeutic role in patients who have ingested a small, or moderate though potentially lethal, amount of paraquat.

77-1888. Krapez, J. R.; Cole, P. (St. Bartholomew's Hosp., London, England). **The management of acute poisoning. A summary.** *Anaesthesia* 32(5): 494-498; 1977.

Guidelines are presented for the management of the more common types of poisoning currently encountered in the United Kingdom. In most poisoning cases the essential need is for rapid assessment of the condition of the patient followed by effective general supporting therapy. Assessment considers the following conditions of the patient: coma, respiratory depression, shock, and hypothermia, as well as identifying the poison. Depending on the poison, emergency and general supportive therapy may include oxygen, airway protection, pulmonary care, intermittent positive pressure ventilation, humidification, intravenous infusion, metabolic acidosis treatment, convulsion control, gastric lavage, use of emetics, general nursing care, increasing urine output, catheterization, temperature control, fluid therapy and balance of electrolytes. Specific therapy is given for barbiturates, salicylates, glutethimide, carbamates, tricyclic antidepressants, opiates and opioids, paracetamol, oral hypoglycemic agents, iron, cyanide, carbon monoxide, lead, organophosphorus compounds, arsenic, cardiac glycosides, paraquat, phenol and corrosives, and bleaches.

77-1889. Naulty, J. S.; Reves, J. G.; Tobey, R. E.; Schultz, W. W. (Natl. Naval Med. Cent., Bethesda, MD 20014). **Hepatitis and operating-room personnel: an approach to diagnosis and management.** *Anesth. Analg. (Cleveland)* 56(3): 366-372; 1977. (40 references)

Hepatitis occurs in health-care workers about twice as frequently as in the general population. An even higer incidence of hepatitis occurs in operating room personnel than in other classes of health care workers, with anesthetists having a history of hepatitis three times the incidence of other workers in this field. The cause of the increased incidence in operating room personnel is not clear. The frequent handling of blood products, contact with oral secretions and serum of patients with viral hepatitis, and exposure to possibly hepatotoxic chemicals such as anesthetics and solvents are all possibilities. Common causes of hepatitis in the United States are listed, with their distinguishing features. DDT, an insecticide, and arsenic, contained in some agricultural chemicals, are both capable of producing hepatitis in humans. Diagnosis and management of hepatitis are detailed. Long-term management of operating room personnel with hepatitis is considered.

77-1890. Friedman, M. A.; Griffith, F. D.; Woods, S. (Dep. Pharmacol., Med. Coll. Virginia, Health Sci. Div., Virginia Commonw. Univ., Richmond, VA 23298). **Pathologic analysis of mink mortality in New England mink.** *Arch. Environ. Contam. Toxicol.* 5(4): 457-469; 1977. (12 references)

The underlying cause of death of a group of New England mink which died in 1969 to 1970 was explored. PCB and chlorinated hydrocarbon pesticide levels were measured. Aroclor 1254 levels in these mink were elevated 73 fold over levels in healthy mink in 1974. DDT levels were elevated 5 times and DDE 3 times over those control animals. Gross pathology revealed lesions of the lung, liver and kidneys. These lesions were confirmed microscopically. The lungs of the New England mink showed inflammation and congestion. Areas of inflammation were also present in the liver. Massive areas of necrosis were seen in the kidneys, both in the medullary and cortical areas. Kidney involvement was greater than any other organ. P.A.S. positive material was seen in each of these organs with the kidneys showing largest amounts of this material. Since the New England mink did not show lesions of the G.I. tract, did not exhibit fatty degeneration of the liver which PCB toxicity is known to induce in mink, and because they showed areas of congestion, inflammation and positive P.A.S. material, PCBs were not considered the toxic agent. However, fungus or bacterial infection might be the causative agent. (Author abstract by permission)

77-1891. Kraus, J. F.; Richards, D. M; Borhani, N. O.; Mull, R.; Kilgore, W. W.; Winterlin, W. (Dep. Environ. Toxicol., Univ. California, Davis CA 95616). **Physiological response to organophosphate residues in field workers.** *Arch. Environ. Contam. Toxicol.* 5(4): 471-485; 1977. (9 references)

The physiologic response of 21 male agricultural field workers exposed to foliage-borne Guthion (azinphosmethyl) residues was monitored during routine peach-thinning operations in a northern California orchard. Surveillance included daily venipuncture and urine collection to determine whole blood cholinesterase (ChE) activity and level of dialkylphosphate excretion for 3 baseline (nonexposed) and 5 normal work days. Foliage samples were obtained to measure dislodgeable and total Guthion residues. A decrease in group-mean CHE activity by 15% over the surveillance period was found. Apart from one worker who showed a consistent decrease in CHE activity, reaching a maximum of 30% below baseline at the end of the work week, daily changes in individual ChE activity were erratic. Group-mean dialkylphosphate excretion levels provided a semiquantitative indication of exposure to Guthion. Medical examination before and after the exposure period revealed an absence of clinical signs of organophosphate intoxication. (Author abstract by permission)

77-1892. Peoples, S. A.; Maddy, K. T.; Johnston, L.; Ray, C.; Weindler, F. (Agric. Chem. Feed, Calif. Dep. Food Agric., Sacramento, CA 95814). **Poison exposures of children in California due to ingestion of liquid-formulation pesticides containing sodium arsenite.** *Clin. Toxicol.* 10(4): 477; 1977.

Detailed evaluation of human poison exposure in-

cidents handled by poison control centers in California revealed that about ten percent or more were due to pesticides (this term legally includes disinfectants and sanitizers). About ten percent of the pesticide cases were due to ingestion of liquid formulations of sodium arsenite. Detailed records kept by the Los Angeles Poison Information Center revealed that in 1975, within a total of 31,039 poison exposure cases, center records listed 3,401 of these cases as being exposures to pesticides and plant foods. The center sent individual reports to the State Department of Health on 2,228 pesticide exposure incidents of which 291 were due to liquid sodium arsenite ingestion by people. The largest number (40) occurred in September. The median age of the exposed persons was 1-1/2 years. These incidents have been resulting in large numbers of cases requiring extensive medical attention. Although animal test data on adult male rats indicates that sodium arsenite has an oral LD50 in the 20 to 50 milligrams per kilogram range, it has become evident that ingestion of less than 1 milligram per kilogram can result in serious illness and 2 milligrams per kilogram can lead to the death of a a child. In order to eliminate this serious problem, California has taken regulatory action to remove from sale pesticides for home and garden use that contain free-flowing liquid sodium arsenite. (Author abstract by permission)

77-1893. Quinby, G. E. (Prev. Med., Wenatchee, WA 98801). **Poisoning of construction workers with disulfoton.** *Clin. Toxicol.* 10(4): 479; 1977.

Parathion has caused frequent epidemics of poisoning of agricultural workers from crop residues since 1948. Although disulfoton (Di-Syston) has approximately the same basic toxicity in experimental animals, the applications of disulfoton have been so different or other factors prevail so that occupational residue poisoning has not been heretofore reported. Three carpenters were accidentally sprayed on Nov. 16, 1974 with disulfoton being applied by airplane to a wheat field adjacent to three framed, partly roofed duplexes. In the ensuing days following each reexposure for weeks, the carpenters were repoisoned as they handled the building materials so heavily contaminated that sparrows roosting periodically in the enclosed buildings died for at least 17 days and probably longer. Two of the older of the three carpenters experienced coronary accidents within their convalescent periods, and one had at least two severe cerebral vascular accidents. These vascular incidents confirm the 1961 suggestions of von Kaulla and Holmes that organic phosphorus poisoning frequently causes disturbances of clotting mechanisms and sometimes may precipitate vascular pathology. Apparently without knowledge of prior work in humans, Hassan and Cueto in 1970 reported virtually identical hypercoagulability in rabbits dosed orally with a mixture of DDT, carbaryl and parathion. (Author abstract by permission)

77-1894. Groundwater, J. R. (Univ. California Med. Sch., San Francisco, CA 94108). **Difolatan dermatitis in a welder; non-agricultural exposure.** *Contact Dermatitis* 3(2): 104; 1977. (2 references)

This report concerns sensitization to difolatan occurring in a non-agricultural worker. The 41-year-old welder was employed by a plant maintenance company which serviced plants distributing difolatan. He had worked in various plants for 1.5 years, during which time he frequently brushed against large bags of difolatan. Although he had not previously been troubled, he suddenly developed marked vesiculation and edema of his face and hands, with associated wheezing. Various attempts to work in other plants which distributed difolatan resulted in recurrences despite extensive protective measures. Patch testing was unremarkable except for a 2+ reaction to 1% difolatan in petrolatum at 72 hours. A test to 0.1% difolatan in petrolatum subsequently became positive. Systemic steroids were required to suppress the patch test reactions.

77-1895. Brancaccio, R. R.; Chamales, M. H. (Dep. Dermatol., Univ. Oregon Health Sci. Cent., Portland, OR 97201). **Contact dermatitis and depigmentation produced by the herbicide Carbyne.** *Contact Dermatitis* 3(2): 108-109; 1977. (3 references)

A 50-year-old man employed as a sprayer of agricultural herbicides and insecticides presented with a 1 1/2 year history of dermatitis and depigmentation of his hands and wrists. The patient developed pruritus, edema and erythema on the dorsum of both hands in March 1974. The initial dermatitis lasted 6 to 8 weeks, and was followed by a residual depigmentation of the dorsum of both hands and the volar surfaces of the wrists. The patient was exposed to about 70 herbicides and insecticides a year. However, during the onset of both attacks of dermatitis he was exposed specifically to carbyne (barban). The patient was treated by his physician with triamcinolone cream 0.1%, and by himself with Pacquin medicated cream, which contains ortho-phenylphenol. It is suggested that the depigmentation developed from the phenolic degradation product, 2-chloro-4-aminophenol.

77-1896. Anonymous. **Bulrushes decrease PCB contamination.** *Chemistry* 50(5): 4-5; 1977.

Experiments are described which suggest that bulrushes planted in streams and rivers may be a weapon in the fight against PCB pollution. Bulrushes (*Scirpus lacustris*) were planted in water containing PCB pollution. After a week's time, the plants had reduced PCB concentration by 40%; by 50% after two weeks. The PCBs which settled on the bottom silt were attacked by planting water-weeds that directly absorb PCB from silt. Plants were kept in water with PCB concentrations of about 30 ppm for periods of from three to 14 days. Bulrushes have a porous, sponge-like interior that evidently soaks up the contaminants from water. The possibility of using this method in case of other contaminants also is being studied.

77-1897. Goncharuk, E. I.; Perelygin, V. M.; Tsipriyan,

V. I.; Badrak, S. A.; Sokolov, M. S.; Shostak, L. B. (Kiev. Med. Inst., Kiev, USSR). **Nauchnoe obosnovanie metodiki rascheta predel'no dopustimykh urovnei vneseniya (PDUV) ekzogennykh khimicheskikh veshchestv v pochve. [Scientific substantiation of the method of calculating the maximum permissible levels of introduction of exogenous chemical substances into the soil.]** *Gig. Sanit.* (3): 29-33; 1977. (5 references) (Russian)

A calculation method is suggested for determining the maximum permissible levels of introduction (MPLI) of exogenous chemical compounds into the soil, based on their maximum permissible concentration (MPC) and the specific soil and climatic conditions of a given zone. This obviates setting separate MPC values for different zones. In the scientific substantiation of this method, the functional relationship between the value for the residual quantity of toxic substance in the soil and the soil-climatic factors influencing the degree of its detoxication and migration was determined. The following were found experimentally to be the main factors: humus content, porosity of the soil, amount of sediment, length of insolation, average and maximum soil temperature during the vegetation period, pH of the soil, and length of observation. As an example, the calculation of the MPLI of DDT is given for the chernozem zone, and the MPLI of hexachlorocyclohexane (BHC) is computed from that by using a coefficient derived from the persistence of hexachlorocyclohexane relative to the persistence of DDT in the same conditions.

77-1898. Acton, C. (Author address not given). **Carcinogens.** *Md. State Med. J.* 26(6): 26; 1977.

This brief article describes infomation on carcinogens presented at the Baltimore City Medical Society meeting. The United States was reported as being at the top of the list in cancer deaths, with Baltimore having the highest incidence in this country. Baltimore is also above average in occupational cancer deaths, with males generally having more cancer deaths than females, and whites more than blacks. Lung cancer mushroomed to claim 12% of all malignancies reported in the Sparrows Point area of Baltimore. Allied Chemical Company's production of insecticide in that area became suspect. The insecticide produced contained arsenic, a well-known carcinogen. It was noted that there was a relation between cancer incidence and the distance one lived from the factory and that the incidence was higher among males, the workers in the factory. The spread of cancer death intensity was toward the northwest, against the prevailing winds, which seemed to rule out the concept of spread by dust or fumes. However, this was the direction through which the trains bearing the arsenic ore were routed. Examination of the soil by the tracks showed an arsenic content several times higher than soil away from the track and in remote areas. The factory has been closed.

77-1899. Ongari, R.; Accordi, V (Pediatr. Div., Mantova Hosp. Inst., Mantova, Italy). **Gli avvelenamenti acuti accidentali nella casistica della Divisione di Pediatria dell'Ospedale di Mantova. [Acute accidental poisonings in the Division of Pediatrics, Mantova Hospital.]** *Minerva Pediatr.* 29(3): 173-182; 1977. (49 references) (Italian)

In a seven year period, 1968-1974, 360 patients were admitted to the Pediatrics Division of Mantova Hospital for accidental acute poisoning. The data presents an annual increase in admissions of intoxications due to drugs as compared to household products. There was also a higher incidence of psychodrug poisonings. Rodenticides accounted for 5.1% of the cases, DDT and other insecticides for 3.8%, and fungicides for 2.6%. Prophylactic action was stressed as a control to the problem of acute accidental poisoning in children.

77-1900. Kiraly, J.; Czeizel, A.; Szentesi, I. (Budapest Chem. Works and Natl. Inst. Hyg., Budapest, Hungary). **Genetic study on workers producing organophosphate insecticides.** *Mutat. Res.* 46(3): 224; 1977.

Organic phosphorus insecticides may cause human chromosome mutations in persons with severe acute intoxication. In order to obtain data on the genetic effect of prolonged occupational exposure to small doses a study was initiated on workers producing and formulating organic phosphorus insecticides in the Budapest Chemical Works. On the one hand the chromosomes of O-control (49 persons), industrial control (14 persons), positive control (tetrachlorobenzene, 25 persons) and three organophosphate insecticide groups (trichlorfon, 17 persons; diazinon, 34 persons; phosmet, 25 persons) were studied in peripheral blood cultures. The frequency of chromatid-type aberrations in all organophosphate groups was higher than in controls. Occurrence of stable chromosome-type aberrations was higher in the diazinon group. On the other hand a genetic-epidemiologic survey has been made of nearly 2000 workers. Evaluation of data is in process. (Author abstract by permission)

77-1901. Lekevicius, R.; Sinkevicius, S. (Vilnius State Univ., USSR). **Genetical monitoring of the natural population of birds and mammals with different accumulation of mutagens.** *Mutat. Res.* 46(3): 229; 1977.

It was found that chloro-organic compounds, namely, metabolites of dichloro-diphenyl- trichloroethane (DDT) accumulate in high concentrations especially in the reproductive glands of the investigated birds (*Larus ridibundus L., Aythya fuligula L., Sterna hirundo L., Podiceps cristatus L.*). For instance, in the ovary of *Larus ridibundus* L., an average of 10 mg/kg metabolites of DDT and in the testes 47.5 mg/kg have been found; this is 2.8 and 13.8 times more than in the fat of the same birds. Females with 10 mg/kg of chloro-organic compounds in the ovaries lay eggs with a concentration from 0.71 up to 1.25 mg/kg of these compounds in the contents of an egg. Similar doses of the metabolites of DDT which were found in the reproductive glands induce significant levels of gene and

chromosomal mutations in different experimental objects as was shown by Markarjan (1966), Legator (1969), Buselmaier et al. (1972), Vogel (1972), Lekevicius, Sinkevicius, Slucka (1976). Part of these mutations induce dominant lethality in the form of unhatched nestlings of birds. Unhatched nestlings were found 2-3 times more often in *Podiceps cristatus* L. Than in the other three bird species investigated. This phenomenon is correlated with the concentration of the mutagens in germ cells. Lethality during early embryogenesis was found in 80% of all cases. The number of chromosomal aberrations in bone marrow cells of *Clethrionomys glareolus* Sch. and *Microtus arvalis* Pall. (individuals from populations not isolated from the fields treated by DDT) was found to be higher than that of animals from island populations of the lake Kretuonas where the pesticides have not been used. A correlation between the number of chromosomal aberrations and the level of accumulation of mutagens in different biological systems was found. The mutagenic effect of some environmental mutagens may cause great damage to certain species and biological systems. Monitoring populations of wild animals with high and low levels of DDT metabolites may be used as a useful model for extrapolating the genetic danger of these compounds in man. (Author abstract by permission)

77-1902. Matsushima, S. (Administrative Dept. of Health, Saku Gen. Hosp., Usuda, Nagano, Japan). [**Pharmaceutical treatment of intoxication due to agricultural chemicals.**] *Naika (Internal Med.)* 39(6): 1217-1219; 1977. (5 references) (Japanese)

Pesticides, their symptoms of intoxication and antidotes are presented. The cholinesterase inhibitors such as organophophosphates and *N*-methylcarbamates can be treated with PAM (pralidoxime) and atropine. Organofluorines impair the cardiovascular and central nervous systems. Injections of glucose, acetamide, procainamide and pentobarbital may be effective. Phenobarbital is a remedy for organochlorine induced convulsions. Conjunctivitis and keratitis caused by Blasticidin B may be treated with corticoids. Antidotes and symptoms for some specific pesticides are given.

77-1903. Mukhtarova, N. D. (Inst. Hyg. Toxicol. Pestic., Polymers, Plastics, Kiev, USSR). **Otdalennye posledstviya patologii nervnoi sistemy, vyzvannoi vozdeistviem malykh kontsentratsii etilmerkurkhlorida.** [**Late aftereffects of nervous system pathology provoked by the action of low ethylmercuric chloride concentrations.**] *Gig. Tr. Prof. Zabol.* 20(3): 4-7; 1977. (8 references) (Russian)

Nervous system dynamics and other clinical parameters were examined 1.5-3 yr after exposure in 25 persons exposed repeatedly to low ethylmercuric chloride concentrations. EEG and Asschner-Dagni reflexes were among the clinico-physiological parameters examined, and the biochemical factors included catecholamines, sugar, mercury, and urinary DDT and DDE levels. The nervous system pathology was somewhat altered compared to the earlier examinations. Changes were observed in sympathico-adrenal function. Vascular lesions in the brain resembled transient derangements of cerebral circulation in the vertebro-basilar basin and angiospasms. Diffuse changes were seen in the nervous system, with predominant involvement of hypothalamic cerebral structures and sometimes psychological disturbances.

77-1904. Reid, G. M. (Min. Agric. Fish., Christchurch, New Zealand). **Phosphorus baits not harmful to honey bees.** *N. Z. J. Agric.* 134(4): 26-27; 1977. (1 reference)

A farmer questioned the possible harmfulness to his bees of rabbit control baits made of a mixture of raspberry jam and phosphorus. When samples of bait were placed near hives that held active foraging bees, the bees were not attracted to the baits. The baits were then placed inside the hives and the bees consumed them completely within two days. No adverse effects were noted. In laboratory experiments bees fed phosphorus-containing jam as sole food source survived an average of only four days, as compared to six days when fed jam without phosphorus. However, phosphorus is not quickly lethal to honey bees even under artificial caged conditions. Field bees are further protected by the degradation of phosphorus in the open and by the careful placement of baits. Phosphorized jam was also fed to bees and the honey analyzed for elemental phosphorus. No phosphorus was detected; the limit of detection with the method used was less than 1 mg/kg.

77-1905. Pitrez, S.; Sckert, S.; Eschiletti, S. (Author address not given). **Intoxicacoes agudas na infancia. Sistema de fichas de atendimento. 2-a parte.** [**Acute intoxications in childhood. Clinical card system. Part 2.**] *J. Pediat. (Sao Paulo)* 40(11-12): 374-381; 1975. (Portuguese)

A quick reference outline for treatment of acute intoxications is provided. Procedures and drugs used in these cases include removing the poison from the digestive tract by induction of vomiting or gastric lavage; administration of antidotes and adsorbents, general or specific (e.g., activated charcoal and atropine for parathion); and miscellaneous measures including the use of laxatives, alkalinizing agents, diuretics, peritoneal dialysis, hemodialysis, exchange transfusion, bronchial lavage, and skin and eye cleansing. Forced diuresis and dialysis are indicated definitely for certain substances, including heavy metals, and depending on circumstances for others. Toxicity levels and antidotes are given for various groups of pesticides.

77-1906. Teare, D.; Brown, S. (Author address not given). **Poisoning by paraquat.** *Med.-Leg. J. (London)* 44(2): 33-47; 1976.

Findings in several cases of intentional (homicidal and suicidal) paraquat poisoning are reviewed in reference

to a celebrated homicide case. A 22-year-old man was hospitalized with a 48-hr history of sore throat and abdominal pain and 24 hr of vomiting. Chemical and radiologic examinations revealed only lung opacification suggestive of viral pneumonia. Despite the combination of throat, renal and lung damage the possibility of paraquat poisoning was not raised until he had been hospitalized for ten days and his condition was grave. He died 15 days after poison had been administered. The presence of paraquat in a urine sample collected after ten days of hospitalization was confirmed. Postmortem revealed that the lungs were totally solid and kidney and liver changes were extensive. The quantity of paraquat ingested was clearly substantial.

77-1907. Lee, G. F.; Piwoni, M. D.; Lopez, J. M.; Mariani, G. M.; Richardson, J. S. (Texas Univ. Dallas, Richardson Inst. Environ. Sci., Dallas, TX). **Research study for the development of dredged material disposal criteria.** *Natl. Tech. Inform. Serv.* AD-A019,953, 1975, 386p.

The report represents the results of the second phase (laboratory evaluation) of a two-phase study to establish the effects of the presence of various dredging and discharge procedures on water quality and aquatic organisms. The basic analytical procedure specified for use in implementing the requirements of Public Laws 92-500 and 92-532 is referred to as the Standard Elutriate Test. This report discusses the factors influencing the release of chemical contaminants from dredged sediments during the elutriate test procedure and evaluates the effectiveness of the test in comparison with other procedures such as bulk sediment analysis. Individual parameters included and numerical values assigned to them as indicators of levels of pollution are discussed individually. Sediments used for the Standard Elutriate Test evaluation and subsequent bioassay research were from the Trinity River, Houston Ship Channel turning basin, port Aransas Channel, and Corpus Christi Bay, Texas; Mobile Bay, Alabama; Bridgeport, Connecticut; and Ashtabula, Ohio. The oxygen content of the elutriate was found to be one of the most important factors influencing the release of chemical contaminants from dredged sediments during the test. However, the test was found to be insensitive to many other parameters, such as shaking time, method of agitation, solid-to-liquid ratio, and various filtration procedures. (Author abstract by permission)

77-1908. Riley, B. T. Jr. (Munic. Environ. Res. Lab., Solid and Hazardous Waste Div., Cincinnati, OH). **Summation of conditions and investigation for the complete combustion of organic pesticides.** *Natl. Tech. Inform. Serv.* PB-248,177, 1975, 76p.

The disposal of various types of pesticides by incineration without significant insult to the environment is a major problem. This project summarizes the findings of several investigators, who tested the combustion efficiency of several pilot plant scale incinerators on several classes of pesticides. A brief discussion of a classification technique for pesticides is included, as well as a brief discussion of theoretical combustion requirements. (Author abstract by permission)

77-1909. Markel, H. J. Jr.; Lucas, J. B. (Natl. Inst. Occup. Saf. Health, Cincinnati, OH). **Health hazard evaluation/toxicity determination report H.H.E. 74-117-251, Wayheuser [sic] Treating Plant, De Queen, Arkansas.** *Natl. Tech. Inform. Serv.* PB-249,431, 1975, 20 p.

A lumber preservation facility was investigated by NIOSH in order to evaluate employee exposures to chemicals used in the wood treating area of the plant. Based on the results of physical examinations, clinical laboratory studies, observed work practices, a review of relevant literature, and environmental sampling, it was determined that there were definite toxic exposures resulting in chloracne from pentachlorophenol contaminants. It was also determined that employee exposures to cresol, arsenic acid, copper sulfate, and sodium bichromate were not toxic at the concentrations measured. (Author abstract by permission)

77-1910. Office of Water Supply (Environ. Protect. Agency, Washington, D.C.). **Statement of basis and purpose for the National Interim Primary Drinking Water Regulations.** *Natl. Tech. Inform. Serv.* PB-250,011, 1975, 183 p.

The Statement of Basis and Purpose for the National Interim Primary Drinking Water Regulations contains the concepts and rationale for arriving at the specific Maximum Contaminant Levels in the Regulations which were promulgated on December 24, 1975. In addition to the material in support of the maximum contaminant levels for 10 inorganic chemicals, six organic chemicals, turbidity and microbiological contaminants, material is also included which provides the basis for the lack of maximum contaminant levels for certain other contaminants. Among the latter are sodium, sulfate, organics-carbon absorbable, cyanide, certain pesticides and general bacterial populations. Numerous literature citations are provided in support of the narrative material. (Author abstract by permission)

77-1911. Toups Corp. (Santa Ana, CA). **Water pollution abatement technology, capabilities and costs, irrigated agriculture.** *Natl. Tech. Inform. Sci. Serv.* PB-250,016, 1976, 20 p.

Pollution control options are examined for each of nine geographic regions, comprising 96% of the Nation's irrigated agriculture. Both structural and non-structural controls are considered for three alternative levels of control, with different controls applicable depending upon whether the land is drained or undrained. Aggregated cost estimates (in 1973 dollars) range from $296 million to

$4,450 million depending upon the treatment level selected, with corresponding annual costs of $143 million to $491 million. Costs and effectiveness of control measures will vary widely depending on existing irrigation practices. (Author abstract by permission)

77-1912. Hara, S.; Inoue, T.; Tsuda, R. (Sch. Legal Med., Fac. Med., Kurume Univ., Kurume, Fukuoka, Japan). [**Autopsy in a case of gastromalacia due to ingestion of dichlorvos.**] *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 31(2): 72; 1977. (Japanese)

A one year old girl died from the intentional administration of 10 ml of dichlorvos during a murder-suicide by her mother. During the autopsy a large gastric perforation was found. It extended from the cardiac portion to the greater curvature with a grey/black periphery and no vital reaction. For comparison, a guinea pig was administered 10 ml. of dichlorvos orally. Two hours after death redness, erosion and thinning of the gastric mucosa from the cardiac portion to the greater curvature was observed. Five and 10 hr later this area was perforated. Xylene gave redness, not perforation, and the emulsifier of the formulation did not result in perforation after 5 or 10 hr. These results show that dichlorvos itself was the cause of the mucosal impairment, and the impaired part became a perforation after death. The relation between dichlorvos and antidigestive enzymes should be studied further.

77-1913. Soil and Pesticide Div. (Environmental Agency Tokyo, Japan). [**Standards for withholding registration of agricultural chemicals established by the director-general of the environment agency. Part III.**] *Jpn. Pestic. Inform.* 29: 19-20; 1977.

The standards for withholding registration of agricultural chemicals as established by the director general of the environmental agency are presented. These standards were determined by the environmental agency, located in Kasumigaseki, Tokyo, Japan and pertain to the following chemicals: CVMP or tetrachlorvinphos, chlorpyrifos, phosalone, CYP or cyanofenphos, ametryn, paraquat or paraquat dichloride, thiophanate-methyl, hydrogen cyanide, ethion, benzomate, BPMC, atrazine, CPCBS or chlorfenson, diquat or diquat dibromide, isoxathion, binapacryl, and trifluralin.

77-1914. Nomura, S. (Sch. Dermatol., Fac. Med., Kumamoto Univ., Kumamoto, Kumamoto, Japan). [**Studies on the diagnostic standards of dermatitis due to pesticides for agricultural uses (studies commissioned by the ministry of health and welfare for fiscal year 1975).**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(1): 49-50; 1977. (Japanese)

In order to establish a standard method for patch testing of pesticides, a field survey, clinical studies, and animal experiments were carried out on test concentration, solvent, time of application, and evaluation, as well as technical examination of photopatch tests. The essential character of "lettuce dermatitis" was studied on 51 adults working on lettuce growing farms; 50% of the workers were found positive to alcoholic extract of lettuce; 78% of the workers were positive to each of 12 kinds of pesticides, and about half of those positive were positive to multiple pesticides. The concentration of 0.1% was recommended as the standard, and the time of 48 hr was recommended as the application time. The photopatch tests were carried out on pesticide dermatitis patients using a xenon lamp with a UV-29 filter and pesticides such as MO (CNP), nitrofen, paraquat, trifluralin, chlorothalonil, dicofol, tetradifon, chlorfenson plus chlorfenethol, fenitrothion, and dichlorvos. Many positives were found to paraquat, chlorothalonil, and trifluralin, and some positives to nitrofen, tetradifon, fenitrothion and dichlorvos. Results of maximization tests on guinea pigs showed that there was a difference in response between that after 24 hr and that after 48 hr according to the kind of pesticide.

77-1915. Kobayashi, S.; Nagata, H.; Izumiyama, T.; Kamata, K.; Takano, S.; Saito, M.; Suzuki, K.; Kurotani, S.; Ono, S. (Hokushin General Hospital, Nagano, Nagano, Japan). [**Problems of cooperative pesticide application from the viewpoint of health management.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(1): 62; 1977. (Japanese)

A survey was conducted on operators of speed sprayers (group A) in an area of apple orchard cultivation where health examination, guidance, and survey have been continued for 10 years, and on another group of operators (group B) in another apple orchard area. Due to a decrease in the number of operators, their high retirement rate, and the popularization of smaller, personal speed sprayers the decline of cooperative pesticide application has become marked, with a diversification of the kinds of pesticides of different toxicity, increased risk to the applicators, and increased pesticide residues due to inexperienced operators. According to examinations in 1974, there was no person with abnormal liver function in group A, whereas in group B, there were many persons with abnormal liver function; the existence of hypertension was higher in group B. The use of protective clothing and equipment was more popular in group A. It was considered based on these facts that it is necessary to establish a health management division with health managers in a cooperative crop protection federation to protect farmer-operators from pesticide intoxication.

77-1916. Izumiyama, T.; Nagata, H.; Kamata, K.; Takano, S.; Saito, M.; Suzuki, K.; Kobayashi, S.; Tajiri, H. (Hokushin Gen. Hosp, Nakano, Nagano, Japan). [**Multilateral survey of the health of pesticide applicators in a grape and apple growing area using many kinds of pesticides together. Part 1.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(1): 87; 1977. (Japanese)

A survey was performed on the health of pesticide applicators in a village consisting of 53 orchards. Of the subjects studied, 19 operated speed sprayers and 41 operated hand sprayers. The average number of application days was 23.8 for speed sprayer operators, and 17.5 and 14.2 respectively for male and female hand sprayer applicators. Symptoms of pesticide intoxication appeared in 25, 13, and 20 subjects respectively. The low percentage of speed sprayers using protective masks may be responsible for their high incidence of intoxication symptoms. Overall, there were no apparent abnormalities in the blood and urine due to pesticide exposure. However, some persons did have an abnormal EEG. Three persons exhibited some symptoms of organophosphorus pesticide intoxication. It is suggested that pregnant women and persons with nervous disorders, arteriosclerosis, or chronic illnesses should not apply pesticides.

77-1917. Horiuchi, N.; Ando, S. (Saku Gen. Hosp., Usuda, Nagano, Japan). [**Clinical symptoms of dermatitis due to pesticides, especially its relationship with sunlight dermatitis.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(1): 87-88; 1977. (Japanese)

Clinical symptoms of dermatitis due to contact with pesticides show a characteristics clinical pattern in connection with the mechanism of symptom occurrence. The dermatitis was classified into 5 categories: A) the chemical burn type, which is primary irritative contact dermatitis due to strongly irritative pesticides on the skin; B) the acute dermatitis type, which is allergic contact dermatitis due to moderately irritative pesticides; C) the sunlight dermatitis type of phototoxic contact dermatitis due to hypersensitizing pesticides with light or photoallergic contact dermatitis; and D) special types such as erythroderma, leucodermic melanoderma, lichen planus-like exanthema, etc. Thirty-four pesticide dermatitis patients seen at the authors' hospital in 1975 were classified into types A-E, respectively: 2(A), 14(B), 14(C) and 4(D). After finding some patients who showed sunlight dermatitis symptoms, 19 subjects were photopatch tested; positive responses were found in 5 cases with paraquat, in 4 cases with chlorothalonil, and in 3 cases with trifluralin. These pesticides appear to cause light hypersensitivity of the phototoxicity type.

77-1918. Nagata, H. (Hokushin Gen. Hosp., Nakano, Nagano, Japan). [**Statistical observation on deaths due to pesticide intoxication according to VIII amended ICD from 1968 to 1973.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(1): 88-89; 1977. (Japanese)

Statistical observations on deaths due to accidental pesticide intoxication during 6 years after the application of the 8th amended ICD was carried out. In particular the findings for 1969 in Japan were compared to those published by Hayes in the USA. Deaths due to accidental pesticide intoxication did not show a decrease annually but showed an increase for women in their forties and men and women older than seventy. The cases of suicide by pesticide ingestion showed a clear decrease annually, the decrease being greater in the order of thirties, twenties, and teens. The place where the intoxication occurred showed increases annually in the home and in other locations but a decrease in farming fields. The number of deaths due to accidental pesticide intoxication was twice as great in Japan as in the USA. This is attributed to overconfidence in the concept that pesticides nowadays are of low toxicity and the lack of appropriate information on the constantly appearing new pesticides. These facts might have made farmers less cautious about storage, application, and handling of pesticides.

77-1919. Kusunoki, F.; Kimura, Y.; Hagiwara, K.; Nakamura, H. (Sect. Clin. Testing, Engaru Kosei Hospital, Engaru, Hokkaido, Japan). [**Results of investigations on pesticide intoxication in Kami-Wakubetsu town.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(1): 108-109; 1977. (Japanese)

According to the answers of 144 out of the 950 farmers in Kami-Wakubetsu town who were sent questionnaires concerning pesticide intoxication in 1976, 105 farmers complained of some topical symptoms, and 26 of them showed general symptoms. Fifteen farmers have been under the care of doctors. According to medical examinations performed in July, 1976, on 101 farmers in the town, a reduction of cholinesterase activity was found in 69 farmers, and abnormal values of GOT and GPT were found in 10% of them, respectively. The application of pesticides (up to 40 kinds) on apple orchards and onion fields in the town was carried out more than 15 times solely during the busy farming season.

77-1920. Golberg, L.; Newill, V. A. (Chem. Ind. Inst. Toxicol., PO Box 12137, Research Triangle Park, NC 27709). **Organ systems: environment and disease.** *IN: Report of the Second Task Force for Research Planning in Environmental Health Science*, pp. 351-416 DHEW Publ. No. 77-1277. Vol. 2, 1977. (139 references)

The effects of the environment on human health may be regarded in terms of specific organ systems. Individual organ systems considered include the skin, lung, gastrointestinal tract, cardiovascular system, liver and bile ducts, pancreas, kidney and excretory system, hematopoietic system, central nervous system, neuroendocrine system, immune system, and allergic responses. Specific research needs for each system are discussed. Additional consideration is given to the lung because it serves as a port of entry and a target organ in the detection and quantification of injury. Additional information is also included concerning the cardiovascular system as it relates to arteriosclerosis and hypertension, and the possible relationships between environmental mutagens and cardiovascular disease. Under the section on the central nervous system, information is included on the susceptibility of the brain to blood-borne agents, manifestations of

central nervous system injury, reversible and irreversible damage, uniquely susceptible populations, inhalants, ingested and contact CNS toxicants, and psychotropic drugs.

77-1921. Iwasaki, I. (Second Sch. Internal Med., Fac. Med., Okayama Univ., Okayama, Okayama, Japan). [**Intoxication due to organophosphorus and *N*-methyl carbamate pesticides.**] *Rinsho To Kenkyu (Jpn. J. Clin. Exp. Med.)* 54(5): 1580-1581; 1977. (Japanese)

Organophosphate and *N*-methylcarbamate pesticides inhibit cholinesterase activity. Similar symptoms of intoxication are manifested by each. Joint treatment with PAM (pralidoxime) and atropine is preferred for the reactivation of cholinesterase activity in cases of organophosphate poisoning. However, PAM alone will inhibit some aspects of cholinesterase recovery and should be avoided in the treatment of intoxication by *N*-methylcarbamates. Atropine is the preferred treatment.

77-1922. Bach, P. H.; Dennis, H. (Dep. Clin. Exp. Pharm., Univ. Natal, Durban, South Africa). **Diagnosis of acute poisoning.** *S. Afr. Med. J.* 51(26): 958; 1977. (13 references)

Some simple, reliable, and inexpensive means of identifying compounds most commonly implicated in poisoning are discussed. The ultimate aim of these techniques is to provide the rural hospital and practitioner with a limited number of minitoxicology test facilities. Organophosphate insecticide poisoning may be identified by use of the Merckognost Cholinesterase stick, which functions on the principle that the release of acetic acid from acetylcholine by cholinesterase causes paper impregnated with a pH indicator to change color. Plasma or serum pseudocholinesterase activity is measured from a standard color scale, after a 6 minute wait, and expressed as kU/ml. This method concurs closely with a standard spectrophotometric method. The dithionite test has recently been adapted to detect paraquat poisoning. The contents of a capsule (alkaline-buffered dithionite) are emptied into 10 ml of urine. A blue-to-green color indicates paraquat or diquat. This method may be adapted to a semiquantitative determination if suitable standard solutions are used.

77-1923. Iwashita, H.; Inamasu, T.; Kuroiwa, Y.; Sato, Y.; Tateishi, J. (Sch. Neurol., Fac. Med., Kyushu Univ., Fukuoka, Fukuoka, Japan). [**Concentration of benzene hexachloride, DDT, and polychlorinated biphenyls in polyneuropathy associated with dermato-endocrinological changes and dysglobulinemia.**] *Shinkei Naika (Neurological Med.)* 6(3): 273-275; 1977. (12 references) (Japanese)

Investigations were conducted on the cause of polyneuropathy associated with dermato-endocrinologic changes and dysglobulinemia in connection with pesticides. The concentrations of BHC, DDT, and PCBs were determined in the liver, adipose tissue, muscle, cerebrum, cerebellum, spleen, and kidney of a patient who succumbed to this syndrome at age 65. The organs were taken 12 hrs after death and held for 2 wk at -70°C. The concentrations of total BHC were 3.01, 10.12, 9.80, 0.88 0.40, 1.08 and 1.54 μg/g (fat basis) in the above order: the levels β-BHC were 3.00, 10.09, 9.77, 0.81, 0.37, 1.07, and 1.53 μg/g. The contents of total DDT were 2.20, 3.65, 3.27, 0.34, 0.16, 0.03 and 0.52 μg/g in the same order. The concentrations of PCBs ranged from 0.11 to 1.95 μg/g. These values are not very high compared to control values, and the content of PCB in the blood of the patient before death was only 2 ppb, with no abnormal pattern. These results show that BHC, DDT and PCBs should not be considered as the cause of this syndrome, at least in this case.

77-1924. Stobbe, H. (Author address not given). **Haematologische Schaeden durch chemische Umweltnoxen.** [**Hematologic damage due to chemical-environmental noxae.**] *Sitzungsber. Akad. Wiss. DDR, Kl. Math. Naturw. Tech.* 16N: 3-25; 1976. (79 references) (German)

Damage to hematopoiesis is relatively common, recognizable at a surprisingly early time state, and detectable with reasonable effort in studies on the effects of environmental chemicals. Pesticides may enter into the picture of drug-induced hematologic injuries in that pesticides such as lindane are used in treating infestations with ectoparasites. They may also produce occupational illnesses in persons employed in their manufacture and application. The ability of BHC to cause aplastic anemia was noted as early as 1953. The organophosphates were hoped to provide a replacement for organochlorines, but dimethoate and trichlorfon at least have been demonstrated to have hematotoxic effects. The occurrence of bone marrow insufficiency has been demonstrated after occupational exposure to organophosphates, and one patient with such an aplastic syndrome subsequently developed leukemia.

77-1925. Oehme, F. W. (Coll. Vet. Med., Kansas State Univ., Manhattan, KS). **Laboratory diagnosis of chemical intoxications.** *Vet. Clin. North Am.* 6(4): 723-740; 1976. (7 references)

The widespread and often improper or overzealous use of modern chemicals has increased the hazards available to domestic animals. The role of the laboratory in assisting the clinician to arrive at the final diagnosis in toxicity cases is a growing one. This paper discusses the role of toxicology in small animal practice, stressing the purpose and scope of a toxicology laboratory; the individual clinic lab; screening tests for the detection of thallium, arsenic, mercury, antimony, aflatoxins, aspirin, phenothiazines, sulfonamides, and phenolic chemicals; and various biological tests useful in determining the specific or general toxicity associated with selected samples such as urine, vomitus, digestive tract content, diet-

ary components, or baits. The advantages and disadvantages of the local laboratory, the local reference laboratory and the large commercial laboratory are considered.

77-1926. Cuoello, J. M.; Young, A. L.; Smith, J. C. H. (Dep. Biol. Sci., U.S. Air Force Acad., CO 80840). **A method for simulating subsurface disposal of herbicides.** *Weed Sci.* 25(4): 368-372; 1977. (14 references)

Specially designed growth boxes were used to simulate field subsurface injection of phenoxy herbicides. Sorghum (*Sorghum vulgare* Pers.) seedlings were grown in stainless steel containers (inserts) which were placed in plexiglass boxes containing a soil layer that had received 2.240 kg/ha of a 50:50 mixture of the *n*-butyl esters of 2,4-D [(2,4- dichlorophenoxy)- acetic acid]. Plant height data were collected periodically for all treatments. Subsurface herbicide application to both intact and cut root systems significantly altered root growth. Plants with treated, intact root systems showed retarded growth which became more pronounced with time. Plants whose root systems were treated, and cut on day 22, showed an initial acceleration of growth; a trend which eventually reversed itself and resulted in control plant height exceeding that of treated plants. (Author abstract by permission)

77-1927. Carlson, L. A.; Kolmodin-Hedman, B. (King Gustaf V Res. Inst., Stockholm, Sweden). **Decrease in α-lipoprotein cholesterol in men after cessation of exposure to chlorinated hydrocarbon pesticides.** *Acta Med. Scand.* 201(4): 375-376; 1977. (8 references)

Eight men who had been occupationally exposed to lindane in 1970 and for whom the exposure had ceased were studied with respect to their α-lipoprotein cholesterol levels. These men had used a spray solution containing 4% lindane, 0.1% pyrethrum and 2.5% malathion. Although they were supposed to wear protective clothing and masks, this recommendation was not always followed. Both inhalation and skin contact were possible. The frequency of exposure varied from daily to once weekly. The duration of employment varied between one and 25 years, with exposure to lindane discontinued in 1974. A significant fall in α-lipoprotein cholesterol was noted between the years 1970 and 1976 in these men. The cholesterol concentration of the other lipoprotein classes showed no significant trend. The data support suggestions that exposure to chlorinated pesticides, mainly lindane, may raise the α-lipoprotein levels.

See also **77-1822** **77-1823** **77-1836**

77-1928. Dybing, E.; Aune, T. (Dept. Environ. Toxicol., Natl. Inst. Public Health, Oslo, Norway). **Hexachlorobenzene induction of 2,4-diaminoanisole mutagenicity in vitro.** *Acta Pharmacol. Toxicol.* 40(5): 575-583; 1977. (24 references)

The inductive effects of intraperitoneal injections of HCB in rats on 2,4-diaminoanisole mutagenicity in vitro were studied and correlated with those of HCB on microsomal ethylmorphine *N*-demethylase. HCB pretreatment of rats leads to an increase in liver microsomal 2,4-diaminoanisole activation to a mutagen after a dose of 10 mg/kg i.p. and to an increase in ethylmorphine *N*-demethylase after a dose of 50 mg/kg, i.p. The mutagenicity of 2,4-diaminoanisole was increased 24 hours after HCB pretreatment, whereas ethylmorphine *N*-demethylase first increased after 48 hours. There is a sex difference in the inducing effects of HCB on ethylmorphine *N*-demethylase, but not on 2,4-diaminoanisole mutagenicity. HCB pretreatment also led to increases in 2,4-diaminoanisole mutagenicity in the kidneys, but not in the lungs or in fetal liver.

77-1929. Tanaka, K.; Kurihara, N.; Nakajima, M. (Dep. Agric. Chem., Radioisotope Res. Ctr., Kyoto Univ., Kyoto, Japan). **Pathways of chlorophenol formation in oxidative biodegradation of BHC.** *Agric. Biol. Chem.* 41(4): 723-725; 1977. (10 references)

2,4,6-Trichlorophenol is a common major urinary metabolite of lindane and other BHC isomers in mammals. Initial metabolites leading to these and other chlorophenols were heretofore unknown. Neither PCCHE (pentachlorocyclohexane) nor HCCHE (hexachlorocyclohexane) was isolated in sufficient quantities to serve as the intermediate. Pentachlorocyclohexaneone- gemchlorohydrins seem sufficiently labile to be easily converted to the corresponding cyclohexanones, which in turn undergo two-step dehydrochlorinations via their enol forms to yield 2,4,6-TCP. The proposed mechanism explains the observed large isotope effect and was confirmed by chemical reactions aimed at synthesizing pentachlorocyclohexanones.

77-1930. Torkelson, T. R.; Oyen, F. (Dow Chem. Co., Midland, MI). **The toxicity of 1,3-dichloropropene as determined by repeated exposure of laboratory animals.** *Amer. Ind. Hyg. Assoc. J.* 38(5): 217-223; 1977. (11 references)

The toxicity of the mixed isomers of 1,3-dichloropropene, when repeatedly inhaled at low concentrations for six months, was investigated. Four species of lab animals were exposed to nominal concentrations of either 3 or 1 ppm 1,3-dichloropropene in air. Rats, guinea pigs, rabbits and dogs received 7 hr daily exposures 5 days per week to 1 ppm for six months with no adverse effect. The only effect in any group exposed to 3 ppm was a slight, apparently reversible change seen microscopically in the kidneys of male rats exposed seven or four hours daily. Female rats, male and female rabbits, male and female guinea pigs and female dogs exposed repeatedly to 3 ppm 7 hours per day showed no adverse effect. No effects were apparent in either male or female rats killed three months after their last 7 hour exposures to 3 ppm. Based on these data, it is suggested that when repeated, prolonged exposures to the vapors of 1,3-dichloropropene can occur, 7 to 8 hr daily time-weighted average exposures of workmen not exceed 1 ppm.

77-1931. Heritage, A. D.; MacRae, I. C. (Commonwealth Sci. Indust. Res. Org., Div. Irrigation Res., Griffith, S. W., Australia 2680). **Identification of intermediates formed during the degradation of hexachlorocyclohexanes by *Clostridium sphenoides*.** *Appl. Environ. Microbiol.* 33(6): 1295-1297; 1977. (9 references)

Washed cell suspensions of *Clostridium sphenoides* degraded the α-isomer of 1,2,3,4,5,6-hexachlorocyclohexane (α-BHC) via δ3,4,5,6-tetrachloro-1-cyclohexene and the γ-isomer (lindane) via γ-3,4,5,6-tetrachloro -1- cyclohexene. Both intermdiates were further metabolized to unknown substances. The tetrachlorocyclohexane intermediates were identified by gas chromatography and mass spectrometry. (Author abstract by permission)

77-1932. Khan, M. A. Q.; Ashrafi, S. H.; Decker, S. J. (Dep. Biol. Sci., Univ. Illinois, Chicago Circle, IL 60680). **The hepatic ultrastructure of chlordene-fed pigeons.** *Arch. Environ. Contam. Toxicol.* 5(4): 385-402; 1977. (36 references)

Adult male pigeons were fed 500 ppm of nontoxic chlordene per day for 6 weeks. The ultrastructure of hepatic cells of treated pigeons was examined and compared with that of the control birds. Chlordene feeding induced cytological changes in the structure of liver cells. Thinning of the microvilli of bile canaliculi and clear marking of fibrous long spacing and non-fibrous segment long spacing on collagen fibers were noticed. Increase in the number as well as the vacuolation of lipid bodies in certain portions of the cytoplasm, presence of myeloid bodies in mitochondria, and an increase in the smooth-surfaced endoplasmic reticulum were observed in the liver cells of pigeons given chlordene. (Author abstract by permission)

77-1933. Gaillard, D.; Chamoiseau, G.; Derache, R. (Groupe Rech. Toxicol. Aliments Boissons, INSERM-U. 87, Univ. Paul Sabatier, Toulouse, France). **Effect of morestan and other substituted quinoxalines on the activities of various rat hepatic mixed-function oxidases.** *Arch. Environ. Contam. Toxicol.* 5(4): 403-413; 1977. (19 references)

Morestan (6-methyl-2,3- quinoxalinedithiol cyclic-*S*,*S* carbonate) and two of its metabolites: methyl-2,3-quinoxalinedithiol and 6-methyl -2,3-quinoxalinedihydroxy were administered to male and female rats by intraperitoneal route for 4 consecutive days

(50 mg/kg/daily). Morestan was also administered by esophageal intubation for 4 days at the dose of 75 mg/kg/daily. After evaluating the pentobarbital sleeping time in the animals on the 5th day, aminopyrine *N*-demethylase, *p*-nitroanisole *O*-demethylase and aromatic aniline hydroxylase activities and levels of cytochrome P450, proteins and RNA were measured in whole liver. The 3 substances studied caused considerable decreases in activity of certain microsomal enzymes: morestan inhibits some hepatic mixed-function oxidase systems; in females it is more active by peroral administration, and in males by intraperitoneal route. However, 6-methyl-2,3-quinoxalinedithiol is an even more powerful inhibitor of monooxygenase activities both in males and females. 6-Methyl-2,3-quinoxalinedihydroxy also decreases activity by microsomal enzymes, but its action is inferior to that of the other two products investigated. (Author abstract by permission)

77-1934. Thirugnanam, M.; Forgash, A. J. (Dep. Entomol. Econ. Zool., Rutgers-The State Univ., New Brunswick, NJ 08903). **Environmental impact of mosquito pesticides: toxicity and anticholinesterase activity of chlorpyrifos to fish in a salt marsh habitat.** *Arch. Environ. Contam. Toxicol.* 5(4): 415-425; 1977. (23 references)

Chlorpyrifos was tested for its influence on the *in vitro* and *in vivo* brain acetylcholinesterase (AChE) activity of *Fundulus heteroclitus* under laboratory as well as field conditions. The concentration required for a 50% reduction in the *in vitro* enzyme activity (I50) was 72 μM for the parent compound and 4.1 M for its oxygen analog. A 96-hr exposure of live fish to 1.0 μg/L chlorpyrifos resulted in a maximum AChE inhibition of 24%. At a concentration of 2.1 μg/L or higher, a 100% enzyme inhibition was observed after a 24-hr exposure period, followed by varying degrees of recovery during the next 24 hr. A second peak of AChE inhibition, proportional to the concentration of the insecticide, was observed 72 hr after the initial exposure and this was followed by a second phase of recovery during the next 24 hr. In spite of an initial 100% AChE inhibition at test concentrations of 2.1 μg/L and above, the fish mortality was less at lower concentration of the insecticide than at the higher levels. The 96-hr TL50 and TL5 (tolerance limit for 50% and 5% fish survival) of chlorpyrifos for *F. heteroclitus* were 4.7 μg/L and 12.2 μg/L, respectively. The LT50 (lethal time in which 50% of the fish died) at a concentration of 5.6 μg/L was 49.5 hr. Fish exposed to 4 successive field applications of chlorpyrifos granules showed AChE inhibition ranging from 56 to 100% and the insecticide effect was cumulative in nature. By 24 hr after the second application, 18.6% of the treated fish had died; live fish collected at this time showed a 96.2% depression of AChE activity. AChE inhibition was still evident (62.2%) in fish 69 days after the final application of chlorpyrifos. (Author abstract by permission)

77-1935. Das, B.; Singh, P. K. (Lab. Blue-Green Algae, Cent. Rice Res. Inst., Cuttack, Orissa, India). **The effect of 2,4-dichlorophenoxyacetic acid on growth and nitrogen fixation of blue-green alga *Anabaenopsis raciborskii*.** *Arch. Environ. Contam. Toxicol.* 5(4): 437-445; 1977. (10 references)

Sodium salt of 2,4-dichlorophenoxyacetic acid (80% active ingredient), commonly applied for the control of aquatic weeds, was used to observe its effect on the growth and nitrogen fixation of a heterocystous bloom forming blue-green alga *Anabaenopsis raciborskii*. A concentration of 10 μg per ml of 2,4-D showed stimulation of growth and nitrogen fixation; these were almost unaffected in the presence of 100 μg per ml in the medium. The alga could tolerate up to 800 μg per ml in liquid culture media with and without nitrate nitrogen and up to 90 μg per ml on agar plates. Nitrogen fixation was inhibited in the presence of higher concentrations. (Author abstract by permission)

77-1936. Fang, S. C.; Fallin, E.; Freed, V. H. (Dep. Agric. Chem., Oregon State Univ., Corvallis, OR 97331). **Maternal transfer of ^{14}C-DDT via placenta and milk and its metabolism in infant rats.** *Arch. Environ. Contam. Toxicol.* 5(4): 427-536; 1977. (12 references)

Female rats were dosed orally with 0.9 mg ^{14}C-ring-labeled *p,p'*-DDT during pregnancy or lactation. The results from the lactation experiment showed that the mean concentration of ^{14}C-DDT in milk was 15.26 μg per g dry weight the first day after dosing, and decreased gradually with a rate constant of clearance of -0.096. The half-life of DDT and its metabolites in milk was approximately 7.2 days. Neonatal rats, sacrificed after 1 to 28 days, showed that the maximal concentration of ^{14}C was generally reached in 1 to 3 days, then declined at a rate comparable to that in milk. Liver, intestine, and carcass had the highest radioactivity; next, in decreasing order, were lung, kidney, heart, brain, and blood. In the liver of the neonate, the relative concentration of DDT was decreased from 100% on the first day to 44% on the 28th day, while DDD and DDE increased gradually to 36% and 22%, respectively. In the experiment with pregnant rats, the results showed that DDT was readily absorbed, transported throughout the whole body, and deposited in the fetuses. The average biological half-life of DDT in various tissues and the fetus was 10.6 hr. DDT was converted more rapidly to DDD, DDE, and two minor unidentified metabolites in the adult liver than in the liver of neonates. DDE and DDD were also found in other tissues and fetuses of pregnant rats. The relative amounts of DDE and DDD varied in different tissues. DDA was not present in all tissues examined. In the placenta and fetuses, it was only detectable, whereas in the lung, intestine, blood, and kidney, it was a major metabolite. (Author abstract by permission)

77-1937. Johnson, M. K. (Molecular Toxicol. Sec., MRC Toxicol. Unit., Carshalton, Surrey, England S5 4EF). **Improved assay of neurotoxic esterase for screening or-**

ganophosphates for delayed neurotoxicity potential. *Arch. Toxicol.* 37(2): 113-115; 1977. (5 references)

The assay of neurotoxic esterase (NTE) in brains taken from dosed hens enables potential neurotoxicity of organophosphate pesticides, plasticizers, etc. to be assessed. The original assay [Johnson, M. K. *Biochem. J.* 114, 711-717 (1969)] has been simplified to eliminate centrifugation and transfer steps and both the selectivity and the sensitivity have been increased. The procedures necessary to obtain stable reagent stocks are described. (Author abstract by permission)

77-1938. Mandell, B.; Stahl, P. (Dep. Physiol. Biophys., Washington Univ. Sch. Med., St. Louis, MO 63110). **Effects of diisopropyl phosphorofluoridate on rat liver microsomal and lysosomal β-glucuronidase.** *Biochem. J.* 164(3): 549-556; 1977. (24 references)

iPr_2PF (di-isopropyl phosphorofluoridate, DFP) administration to rats produces a liver-dependent specific elevation of plasma β-glucuronidase activity. The response is unaffected by puromycin pretreatment. By using subcellular-fractionation techniques, the rise in plasma β-glucuronidase activity was correlated temporally with a fall in liver microsomal β-glucuronidase activity. After iPr_2P-F treatment, liver microsomal membranes are depleted of β-glucuronidase but slowly return to normal over 1 week. On the other hand, liver lysosomal β-glucuronidase activity is high at early time points (less than 60 min) after iPr_2P-F administration but decreases to below control values; this lasts for a few days. The response to iPr_2P-F was demonstrated in isolated hepatocytes prepared from iPr_2P-F-treated rats. In such preparations, microsomal β-glucuronidase is lost rapidly, followed by a specific decrease in hepatocyte lysosomal β-glucuronidase. The results suggest that a pool of microsomal β-glucuronidase serves as precursor to plasma β-glucuronidase in iPr_2P-F-treated rats, and further, that microsomal β-glucuronidase may serve as precursor to lysosomal β-glucuronidase. (Author abstract by permission)

77-1939. Ishii, H.; Suga, T.; Niinobe, S. (Dep. Clin. Biochem., Tokyo Coll. Pharm., Tokyo, Japan). **Effect of 3-amino- 1,2,4-triazole on in vivo formation of liver triglyceride.** *Biochem. Pharmacol.* 26(13): 1255-1258; 1977. (16 references)

The mechanics of the decrease in the liver triglyceride (TG) level caused by the administration of 3-amino-1,2,4-triazole (amitrole, AT) were studied *in vivo*. The incorporation of [^{14}C]acetate (10 μCi/100 g. i.p.) into liver TG of rats injected with AT (100 mg/100 g. i.p.) decreased about 55 per cent when compared with the control group. Incorporation of [^{14}C]palmitate into liver and serum TG did not differ in the AT and control groups. Incorporation of [^{14}C]acetate into liver TG of rats administered ethanol (600 mg/100 g p.o.) was 3 times that of the control, but with AT-pretreatment incorporation was 50 per cent less when compared with that of the ethanol group. Serum free fatty acids of rats injected with adrenalin (200 μg/100 g. i.m.) increased two times above the control group. The increase was not affected by pretreatment with AT. (Author abstract by permission)

77-1940. Desaiah, D.; Ho, I. K.; Mehendale, H. M. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Ctr., Jackson, MS 39216). **Inhibition of mitochondrial Mg^{2+} ATPase activity in isolated perfused rat liver by kepone.** *Biochem. Pharmacol.* 26(12): 1155-1159; 1977. (39 references)

Hepatic mitochondrial Mg(II) ATPase (MATPase) activity was determined in isolated perfused rat liver preparations. Perfusing for 1-4 hr with 30% rat blood did not affect either the native or DNP (100 μM)-stimulated MATPase activity. Mitochondrial preparations obtained from perfused livers were sensitive to added kepone: first, addition of kepone (chlordecone, μM) resulted in total abolishment of DNP-stimulated MATPase activity; second, over and beyond the abolishment of DNP-stimulated activity, part of the native MATPase activity was also inhibited by kepone (μM). Furthermore, a higher concentration of kepone (10 μM) inhibited the native MATPase activity in a dose-related manner. Liver perfusion with 100 μM kepone in the blood perfusate resulted in a similar abolishment of DNP-stimulated, as well as inhibition of native, MATPase activity. The requirement for a higher concentration of kepone in the perfusion system is due to the partial loss of intracellular kepone from the liver or MATPase activity in the intact liver. These results suggest that interference in energy metabolism of the liver may bear a cause-effect relationship to the previously reported kepone-induced impairment of biliary excretory function. (Author abstract by permission)

77-1941. Schauberger, C. W.; Wildman, R. B. (Coll. Med., Univ. Iowa, Iowa City, IA 52242). **Accumulation of aldrin and dieldrin by blue-green algae and related effects on photosynthetic pigments.** *Bull. Environ. Contam. Toxicol.* 17(5): 534-541; 1977. (14 references)

Aldrin or dieldrin were introduced into cultures of *Anabaena cylindrica*, *Anacystis nidulans*, and *Nostoc muscorum* during log-phase growth to give a final concentration of 1-1000 μg/l. Control cultures received no pesticide. After 7 days, the algae were harvested and analyzed by electron capture gas chromatography; the growth medium was similarly analyzed. In some cases, the absorbance of the cultures was read after 7 days with a spectrophotometer. The test algae were able to significantly accumulate aldrin and dieldrin from aqueous solution. Nostoc, but not Anabaena or Anacystis, apparently metabolized aldrin to dieldrin with subsequent excretion of dieldrin. The three species also showed variations in the levels of the pesticides accumulated from the medium. At 100 g/l pesticide, decreases in pigment (chlorophyll and phycocyanin) absorption were evident, and at 1000 g/l, a

serious impact occurred. Aldrin was more toxic to all three species in this respect than was dieldrin. Transmission electron microscopy revealed no uniquely characteristic alteration in subcellular structure after pesticide exposure, although fewer cells with normal ultrastructure were observed in samples which had been exposed to higher pesticide concentrations. The accumulation of aldrin and dieldrin by blue-green algae may be important in the exchange of these chlorinated hydrocarbons between agricultural run-off and the aquatic environment.

77-1942. Jang, H.; Talamantes, F. (Div. Natural Sci., Univ. California, Santa Cruz, CA 95064). **Effects of chlordane on ova implantation in the mouse.** *Bull. Environ. Contam. Toxicol.* 17(5): 559-563; 1977. (10 references)

On day 1 of pregnancy, BALB/c Crgl mice were injected ip with a single 50 or 100 mg/kg dose of alpha (*cis*) or gamma (*trans*) chlordane. On day 11-14 after mating, the animals were sacrificed and the placentae and embryos examined. A single 50 mg/kg injection of alpha chlordane significantly decreased the number of implanted ova, and 100 mg/kg of gamma chlordane nonsignificantly decreased the number of implanted ova. Implantation was not reduced in mice given 50 mg/kg gamma or 100 mg/kg alpha chlordane. The number of nonpregnant mice tended to be higher in the groups receiving 50 mg/kg alpha and 50 mg/kg gamma chlordane and was significantly higher among animals receiving 100 mg/kg gamma chlordane. All treated animals survived the term of the experiment and no gross fetal abnormalities were detected during dissection. Implantation of ova on days 4-5 after mating may not be severely affected by a single administration of insecticide on day 1 of pregnancy.

77-1943. Paris, D. F.; Lewis, D. L.; Barnett, J. T. (Environ. Res. Lab., U.S. Environ. Protection Agency, Athens, GA 30601). **Bioconcentration of toxaphene by microorganisms.** *Bull. Environ. Contam. Toxicol.* 17(5): 564-572; 1977. (16 references)

The sorption of toxaphene by fungi (*Aspergillus* sp.), bacteria (*Flavobacterium harrisonii* and *Bacillus subtilis*), and algae (*Chlorella pyrenoidosa*) was studied. Toxaphene was not degraded by the microorganisms, even after extended periods of time, and the time required for equilibrium was short for all cultures (10 min for algae, 30 min for bacteria, and 2 hr for fungi). Desorption equilibrium was achieved in as short a time as was equilibrium. Sorption of toxaphene to the microorganisms was described by the distribution coefficient Kd, where Kd = Cm/Cw and Cm = mg of toxaphene sorbed per mg of microorganisms and Cw = concentration of toxaphene in the medium (mg-mg) at equilibrium. The Kd of toxaphene was 3.4×10^3 for *B. subtilis*, 5.2×10^3 for *F. harrisonii*, 1.7×10^4 for *Aspergillus* sp., and 1.7×10^4 for *C. pyrenoidosa*. There was good agreement between the laboratory data and data from a field sample of bacteria and algae. The various toxaphene fractions were not sorbed to the same extent: the later eluting compounds sorbed to a greater extent than did the earlier eluting compounds. There was also an inverse correlation between sorption and water solubility of the various fractions. Thus, the less soluble fractions of toxaphene would be expected to accumulate in biota and be passed up the food chain.

77-1944. Kolaja, G. J.; Hinton, D. E. (U.S. Army Vet. Corps, Vet. Pathol./Surg. Br., Biomed. Lab., Edgewood Arsenal, Aberdeen Proving Ground, MD 21010). ***In vitro* inhibition of microsomal calcium ATPase from eggshell gland of mallard duck.** *Bull. Environ. Contam. Toxicol.* 17(5): 591-594; 1977. (6 references)

The inhibitory effect of DDT on Ca ATPase isolated from microsomal preparations of mallard duck (*Anas platyrhynchos*) eggshell glands were determined and the type of inhibition was characterized by Lineweaver/Burk plots or Michaelis Menten analyses. When 1/velocity was plotted against inhibitor concentration, the inhibitor binding constant was approximately 8.8×10^{-4} g/ml. The competitive nature of the inhibition of Ca ATPase by DDT was shown when the reciprocal of velocity was plotted versus the reciprocal of substrate concentration. The inhibition by DDT was overcome following the addition of more substrate (ATP). Since calcium ATPase has been shown to be associated with calcium transport in the eggshell gland, the inhibition of this enyzme *in vitro* offers a possible explanation for DDT-induced eggshell thinning *in vivo*.

77-1945. Van Dijk, J. J.; van der Meer, C.; Wijnans, M. (Pharmacol. Lab., Poldering 104, Amsterdam, The Netherlands). **The toxicity of sodium pentachlorophenolate for three species of decapod crustaceans and their larvae.** *Bull. Environ. Contam. Toxicol.* 17(5): 622-630; 1977. (18 references)

The toxicity of sodium pentachlorophenolate (Na-PCP) for adults and first instar larvae of two marine decapods (*Crangon crangon* (Linnaeus) and *Palaemon elegans* (Rathke)) and one brackish water decapod (*Palaemonetes varians* (Leach)) was studied. Among the adult decapods, *C. crangon* was the most sensitive to Na-PCP, with an LC50 96 hr at 15 C of 1.79 ppm. The LC50 for *P. elegans* and *P. varians* was 10.39 and 5.09 ppm, respectively. Among the first instar larvae, *C. crangon* and *P. elegans* were equally sensitive (LC50 96 hr at 15 C 0.112 and 0.084 ppm, respectively), while *P. varians* was less sensitive (LC50 0.363 ppm). The period of moulting had no significant effect on the sensitivity of *P. elegans* larvae. The effect of temperature was studied using *P. varians* adults. The toxicity of Na-PCP appeared to increase with temperature, roughly by a factor of 2 for each 10 degrees C. The effect of salinity was also studied using *P. varians*. Although sensitivity did not vary when the salinity was lowered from 100% sea water to 70%, the sensitivity was significantly decreased in 30% sea water.

77-1946. Roslycky, E. B. (Res. Inst., Agric. Canada, London, Ontario N6A 5B7, Canada). **Response of soil microflora and certain crops to vorlex and linuron.** *Can. J. Soil Sci.* 57(2): 103-108; 1977. (20 references)

Vorlex and linuron combination treatments of muck drastically reduced the population of molds, while those of the bacteria and actinomycetes remained practically unaffected. The reduction was due to Vorlex: linuron alone exerted an insignificant influence on the populations. Recovered fungi were not pathogenic and the population change had no detrimental effect on *Lactuca sativa* L. and *Avena sativa* L. (Author abstract by permission)

77-1947. De Lorenzo, F.; Degl'Innocenti, S.; Ruocco, A.; Silengo, L.; Cortese, R. (Fac. Med. and Chir., Univ. Naples, Naples, Italy). **Mutagenicity of pesticides containing 1,3-dichloropropene.** *Cancer Res.* 37(6): 1915-1917; 1977. (12 references)

This paper describes the mutagenic properties of two widely used pesticides: D.D. soil fumigant and Telone, the active principle of which is a mixture of *cis* and *trans* isomers of 1,3-dichloropropene. The test was performed using the bacterial tester stains following the procedure developed by Ames. The active principle isomers were both mutagenic in Salmonella strains TA 1535 and TA 100. A minor component, 2,3-dichloro-1-propene, being about 5% of the commercial preparation of Telone, was also mutagenic in strains TA 1535 and TA 100. Mutagenesis of these tester strains is an indication of a base-pair substitution event causing a missense mutation. While it is difficult to evaluate quantitatively the danger of the contamination of the environment resulting from the use of 1,3-dichloropropene, it is emphasized that due to the nature of the mutagenic effect, even trace amounts in the environment must be considered harmful.

77-1948. Mirer, F. E.; Levine, B. S.; Murphy, . D. (Dep. Physiol., Kresge Ctr. Environ. Health, Harvard Sch. Publ. Health, Boston, MA 02115). **Parathion and methyl parathion toxicity and metabolism in piperonyl butoxide and diethyl maleate pretreated mice.** *Chem. Biol. Interact.* 17(1): 99-112; 1977. (16 references)

Pretreatment of male mice with piperonyl butoxide, 400 mg/kg, 1 h before challenge with insecticides, resulted in a 40-fold antagonism of the acute i.p. toxicity of methyl parathion but potentiated the toxicity of parathion twofold. Piperonyl butoxide had no effect on the toxicity of the oxygen analogs of thse insecticides, methyl paraoxon and paraoxon. Diethyl maleate (1 ml/kg) depleted liver glutathione by 80% after one hour, potentiated the toxicity of both methyl parathion and methyl paraoxon, and partially counteracted the protective effect of piperonyl butoxide on methyl parathion toxicity. Piperonyl butoxide delayed the onset of brain cholinesterase inhibition by parathion. Studies of the metabolism of the insecticides by liver homogenates in vitro demonstrated that piperonyl butoxide inhibited both the oxidative formation of the oxygen analogs (activation) and oxidative cleavage to *p*-nitrophenol and dialkylphosphorothioic acid (detoxification). While parathion metabolism was mostly oxidative, methyl parathion metabolism appeared to be predominantly via glutathione-dependent enzymes. Studies of in vitro distribution of the insecticides demonstrated that piperonyl butoxide pretreatment resulted in elevated tissue concentrations of parathion and methyl parathion; however, the rate constant for elimination from plasma for both insecticides was unaffected by piperonyl butoxide. The overall rate of metabolism of methyl parathion in vivo was approximately twice that of parathion. These results suggest that during piperonyl butoxide inhibition of oxidative activation and cleavage, methyl parathion detoxification continues through uninhitited glutathione-dependent pathways of metabolism. The net result is a reduction in the acute toxicity of methyl parathion. Lack of an effective alternate pathway of detoxification may explain the delayed but greater toxicity of parathion in piperonyl butoxide pretreated mice.

77-1949. Prasad, G.; Das, K. (Dept. Genetics and Plant Breeding, Banaras Hindu Univ., Varanasi, India). **Effects of some growth substances on mitosis.** *Cytologia* 42(2): 323-329; 1977. (17 references)

The cytological effects of three growth substances, giberellic acid (GA), indole-butyric acid (IBA), and 2,4-D were studied on root tip mitosis of *Vicia faba* treated with 10 and 50 ppm concentrations for 3, 6, and 12 hour durations. GA enhanced cell division while both 2,4-D and IBA inhibited it and were also more toxic than was GA. Main effects at the chromosomal level were chromosome breakage, bridge formation, C-mitosis, micronuclei formation, stickiness and chromosome condensation. It is concluded that these chemicals act through different means all of which finally disturb the nucleic acid metabolism causing hazards in protein synthesis which results in breakage of chromosomes.

77-1950. Makeyev, A. M.; Makoveychuk, A. Yu.; Chanikov, D. I. (Nat. Inst. Phytopathol. Res., Moscow, USSR). **Mikrosomal'noe gidroksilirovanie 2,4-D v rasteniyakh. [Microsomal hydroxylation of 2,4-D in plants.]** *Dokl. Akad. Nauk SSSR* 223(6): 1222-1225; 1977. (7 references) (Russian)

The hydroxylation of 2,4-D in the microsomes of plants, one of the main ways of metabolism (and detoxication) of the herbicide, was studied in the hope of clarifying its herbicidal action. The leaves of cucumber and pea plants grown under controlled conditions were homogenized, and different subcellular fractions separated out by centrifugation. The hydrolase activity was found experimentally to be mainly localized in the microsomal fraction of the cucumber leaves. This fact, and the fact that its catalytic action occurs only in the presence of molecular oxygen and reduced NADPH, allows one to

consider it a mixed function oxidase. Preliminary spraying of the cucumber and pea plants with 2,4-D raises the hydroxylating activity of the microsomes. The results obtained in the study point to the participation of NADPH-N-dependent microsomal oxygenases of plants in the processes of hydroxylation and detoxication of 2,4-D. It is probable that this hydroxylation is due to the single NADPH-N-dependent enzyme system in plants, analogous to the cytochrome P-450 system in the liver of animals.

77-1951. Lee, C. C.; Peters, P. J. (Midwest Res. Inst., Kansas City, MO 64110). **Neurotoxicity and behavioral effects of thiram in rats.** *Environ. Health Perspect.* 17: 35-43; 1976. (32 references)

Neural dysfunctions resulting from the long-term feeding of thiram or ferbam to rats are described. Eight of 24 female rats fed 66.9 mg/kg/day of thiram developed neurotoxicity. The effects were characterized by ataxia and paralysis of the hind legs. Demyelination, degeneration of the axis cylinders, and presence of macrophages in the nerve bundle of the sciatic nerve were noted. Degeneration in the ventral horn of the lower lumbar region of the spinal cord was noted by chromatolysis of motorneurons, pyknosis, and satellitosis. In 2 of 24 females fed 65.8 mg/kg/day ataxia and paralysis were noted. An additional 9 showed clasping of the hind feet when picked up by the tail. Nerve conduction could not be measured for one severely ataxic rat and the electromyogram indicated a loss of motor unit function. Periperal nerve may be the primary site of the lesion. Thiram also caused behavioral changes in apparently normal rats. The walking pattern of the hind legs was altered with decreases in stride width and the angle between contralateral steps. These rats required significantly more shock motivations and cleared a lower height in a jump-climb ability test. An open-field study showed that thiram caused hyperactivity in the nonataxic rats of both sexes. Three of 24 rats fed 95.8 mg/kg/day of ferbam also developed ataxia or paralysis.

77-1952. Thomas, J. A.; Schein, L. G.; Donovan, M. P. (Dep. Pharmacol., West Virginia Univ. Med. Ctr., Morgantown, WV 26506). **Some actions of parathion and/or dieldrin on androgen metabolism.** *Environ. Res.* 13(3): 441-450; 1977.

The metabolism of 1,2-^{3}H-testosterone (T-^{3}H) *in vitro* by mouse anterior prostate glands or hepatic microsomes has been studied after the oral administration of dieldrin (2.5 mg/kg daily x 5 or 10) and/or parathion (1.3, or 5.2 mg/kg daily x 5 or 10). T-^{3}H metabolism in the prostate was unaffected by the various treatment regimens. Dieldrin (10 days) caused some reductions in the microsomal production of androstenedione-^{3}H. Only treatment regimens with dieldrin stimulated hepatic testosterone hydroxylases; parathion alone had no effect. This study revealed that dieldrin and parathion can interact and produce biological effects different from those caused by either pesticide alone. The results of such interactions can be changed by altering the dose and duration of one of the pesticides. (Author abstract by permission of Academic Press)

77-1953. Wouters, W.; Van Den Bercken, J.; Van Ginneken, A. (Inst. Vet. Pharmacol. Toxicol., Utrecht, The Netherlands). **Presynaptic action of the pyrethroid insecticide allethrin in the frog motor end plate.** *Eur. J. Pharmacol.* 43(2): 163-171; 1977. (22 references)

The effects of allethrin on synaptic transmission were studied using the motor end plate of the frog as a model. Allethrin (0.1 μM) caused pronounced repetitive activity in the motor end plate. A single nerve stimulus could evoke a train of up to 13 end plate potentials. Such activity was presynaptic in origin, and was due to repetitive firing of the motor nerve terminal. The activity was not accompanied by repetitive firing in the more proximal part of the motor fibers. Repetitive firing did not start till the motor nerve fibers reached the vicinity of the muscle. From that point on their tendency to fire repetitively after treatment with allethrin increased in the distal direction till ultimately all motor nerve terminals showed pronounced repetitive activity. This difference in response to allethrin between proximal and distal parts of the motor nerve fibers is probably not due to a different pharmacological action of allethrin, but may be explained by a shift in membrane conductance parameters, especially the rate of recovery from sodium inactivation, as the nerve fiber approaches the nerve terminal. The repetitive activity induced by allethrin in the nerve terminals was highly dependent on temperature and became much more ponounced as the temperature was lowered, thus showing a truly negative temperature coefficient. Apart from repetitive activity of the presynaptic nerve membrane, no genuine synaptic effect of allethrin was noted, either pre- or post-synaptic, nor was their any significant effect of allethrin on the muscle fiber membrane.

77-1954. Roux, F.; Bescol-Liversac, J.; Guillam, C.; Fournier, E. (I.N.S.E.R.M. Unit Rech. Toxicol. Exper. U. 26, Hopital Fernand-Widal, Paris 10, France). **Etude de l'action toxique du lindane. Modifications biochimiques et ultrastructurales du systeme lysosomial dans l'hepatocyte en culture. [Study of the toxic effects of lindane. Biochemical and ultrastructural alterations of the lysosomal system in cultures hepatocyte.]** *J. Eur. Toxicol.* 9(6): 357-371; 1976. (28 references)

Lindane added over a 40-hr period to a medium for in vitro cultivation of hepatocytes exerts a biphasic effect on the lysosomal system of the cells. Concentrations of 1-25 μM do not affect cell growth; the decrease in acid phosphate activity and the absence of a reaction on the interior of the Golgi sacs indicate a decrease in lysosomal enzyme synthesis. Concentrations in excess of 25 μM produce a decrease in cell growth, but the acid phosphatase activity is partially restored. The presence of enzyme within the vacuoles along with other components and the increase in acid phosphatase activity relative to the

soluble extralysosomal fraction at doses in excess of 150 μM indicate the development of an autophagocytotic process.

77-1955. Fifth Team of Basic Res. Div. (Committee on Safety, Japan Pharmaceuticals Industry Assoc., Tokyo, Japan). [**Test methods for genetic toxicity of pharmaceuticals. Analysis of the status quo and tentatively proposed methods, Part 1 of 2.**] *Gekkan Yakuji (Pharm. Mon.)* 19(5): 773-783; 1977. (Japanese)

Some insecticides for controlling noxious insects such as mosquitoes, flies, fleas, etc. for human and mammalian health are legally closed as pharmaceuticals. The present working group discussed, for one year, the methods for detecting mutagenicity, and the results are reported. After describing the relationship between carcinogenicity and mutagenicity and that between mutagenicity and teratogenicity, the status quo of test methods for mutagenicity was briefly described, with the problems they entail. The methods consist mainly of those utilizing microorganisms (repair test, reversion test, host-mediated assay, reversion tests with metabolic activiation system); those utilizing mammals (in vivo cytogenesis, in vitro cytogenesis, micronucleus test, dominant lethal test, translocation test, in vitro somatic cell mutation test, DNA repair test in somatic cells); and those utilizing insects such as drosophila and silk worms. As a complete experimental system for detecting mutagens does not yet exist, it is important to establish a monitoring system on the human population.

77-1956. Fifth Team of Basic Res. Div. (Committee of Safety, Japan Pharmaceutical Industry Assoc., Tokyo, Japan). [**Test methods for genetic toxicity and tentatively proposed methods. Part 2 of 2. With appendix.**] *Gekkan Yakui (Pharmaceuticals Monthly)* 19(6): 931-940; 1977. (91 references) (Japanese)

Tentatively proposed methods for detecting genetic toxicity were described. At first, the principles of establishing such methods were considered from view-points such as (1) simplicity and inexpensiveness, (2) recommendation as first screening, and (3) sensitivity in detecting almost all mutagens. The test methods recommended include (1) rec assay (repair test) on *Bacillus subtilis* and (2) reversion test utilizing the Ames strain of *Salmonella typhimurium* and B/r WP-2 strain of *Esherichia coli* with or without addition of rat liver homogenate to give metabolic activation. The methods which will be carried out in the future when required were the micronucleus test or in vivo chromosome test and the dominant lethal test. The pharmaceuticals on which such tests are carried out will follow the priority described in the WHO report. The test result of only one method is not be neglected, however, the evaluation should be done after the results of other tests are obtained. The extrapolation of the mammalian test results to mankind should be done taking into account the absorption, distribution, excretion, and metabolism in obtaining the general decision.

77-1957. Blanke, R. V.; Fariss, M. W.; Griffith, Jr., F. D.; Guzelian, P. (Dept. Pathol., Med. Coll. Virginia, Richmond, VA 23298). **Analysis of chlordecone (Kepone) in biological specimens.** *J. Anal. Toxicol.* 1(2): 57-62; 1977. (10 references)

The toxicity and pharmacokinetics of chlordecone (CD) were studied in chemical workers poisoned with this organochlorine pesticide ingredient. A reliable and practical assay procedure was developed which is applicable for CD in a variety of biological specimens. A gas chromatographic method using an electron capture detector is presented together with a discussion of some of the analytical problems associated with this compound. Levels of CD ranging from 5 to 50,000 ppb were measured without modification of the system as described.

77-1958. Kinebuchi, H.; Konno, N.; Yamauchi, T.; Kaneda, M.; Sasaki, K. (Sch. of Pub. Health, Fukushima Prefect. Med. Coll., Fukushima, Fukushima, Japan). [**Delayed neurotoxicity caused by divided administration of critical doses of an organophosphorus insecticide, phosvel (leptophos).**] *Igaku No Ayumi (Prog. Med.)* 101 (12): 837-838; 1977. (6 references) (Japanese)

According to previous experiments, a single p.o. dose of leptophos at 250 mg/kg in adult Leghorn hens was critical for causing paralysis. Four groups of hens (each group consisting of 5 hens) were administered leptophos at 250 mg/kg once, 125 mg/kg for 2 consecutive days, 83 mg/kg for 3 consecutive days, or 50 mg/kg for 5 consecutive days. The number of hens which showed paralysis was 0, 1, 4, and 5 in the above order. The number of days before paralysis appearance in the last 3 groups were 19, 10-14, and 8-9 days. The number of hens that died in each group were 1, 0, 3, and 3. The times between paralysis appearance and death in the last two groups were 7-11 and 5-8 days. The numbers of hens surviving at 45 days after administration were 4, 5, 2, and 2. The results show that divided administration of a critical dose of leptophos enhanced its toxicity, probably due to its bioaccumulation in the hen's body. As paralysis developed, the body weight decreased remarkably to 77% of the orignal, but without loss of appetite. Autopsy of hens that died with paralysis showed complete consumption of subcutaneous and intraperitoneal fat, with abnormal accumulation of feed in the gizzard. Paralysis began from the toe and ascended. The direct cause of death was thought to be paralysis of the respiratory muscles.

77-1959. Konno, N.; Kinebuchi, H.; Yamauchi, T.; Kaneda, M.; Sasaki, K. (Sch. Publ. Health, Fukushima Prefect. Med. Coll. Fukushima, Fukushima, Japan). [**Effects of aging on residues of phosvel (leptophos) in adipose tissue.**] *Igaku No Ayumi (Progr. Med.)* 101(13): 896-898; 1977. (9 references) (Japanese)

According to previous experiments, it seemed that the diminution of residues of leptophos in adipose tissue of hens was affected by the age (in months) of the hen. Two

hundred fifty grams of leptophos were forcibly administered once p.o. to each of 18 hens at the age of 21 months and 6 hens each were killed 1, 3, 7, 14, 21, and 28 days after administration. The same treatment was carried out on hens 6 months of age (in a previous report). Paralysis, indicated as disturbance of gait, was seen in only two hens, 21 months old, fed for 21 days after administration. The decrease of body weight began after 14 days, compared to an increase of body weight after 7 days in younger hens (aged 6 months). The biological half life of leptophos in adipose tissue of older hens (aged 21 months) was 4.9 days, compared to 1.5 days in younger hens (aged 6 months). Although in one of three hens, aged 21 months, killed after 28 days, 0.13 ppm of leptophos residue was detected in the adipose tissue, no residue could be detected in the tissue of hens aged 6 months after more than 14 days. The information that adult hens were severely intoxicated by 2 mg of DFP/kg while younger (20-70 days old) hens showed no sign of intoxication along with the present results would indicate a great significance of residues of organophosphorus pesticides in adipose tissue.

77-1960. Blackman, R. L.; Devonshire, A. L.; Sawicki, R. M. (Dep. Entomol., British Museum, London SW7 5BD, England). **Co-inheritance of increased carboxylesterase activity and resistance to organophosphorus insecticides in *Myzus persicae* (Sulzer).** *Pestic. Sci.* 8(2): 163-166; 1977. (13 references)

Levels of carboxylesterase activity and resistance to dimethoate were assessed in F_1 clones of *Myzus persicae* obtained by crossing sexuales from a resistant, high esterase clone (R) with those from three unsusceptible, low esterase clones. The progeny of the most successful cross fell into two distinct groups, intermediate between the parent clones with respect to both carboxylesterase activity and resistance. The first group averaged 74% of the total carboxylesterase activity, 79% of the esterase band-4 activity, and 86% of the resistance of R. The second group averaged 43% of the total carboxylesterase activity, 33% of the esterase band-4 activity, and 17% of the resistance of R. The results indicate that R may be heterozygous for two alleles coding for increased esterase levels and associated resistance.

77-1961. George, K.; George, M. (Dep. Bot. Univ. Kerala, Trivandrum, India). **DNA relaxing and chromosome uncoiling effect of paraquat.** *Indian J. Biochem. Biophys.* 14(1): 7; 1977.

The effect of paraquat on meiotic chromosomes of *Vicia faba* was investigated in the course of studies on chromosome uncoiling by this compound. Pronounced uncoiling and noncondensation of chromatin fibers were revealed following reaction with sublethal concentrations of paraquat. Uncoiling takes place through relaxation of the DNA core of chromosomes following dispersal of the proteins of their matrix, which normally bind, fold, or spiralize the DNA fibers. Dispersal of proteins and consequent uncoiling of the DNA core could be affected by direct reaction with the chemical or by stimulation of a DNA-relaxing enzyme. This hypothesis was supported by the extension of 1000 A diameter fibers to form longer uncoiled structures, appearance of localized gaps in achromatic lesions indicating continuity of fibers within non-fragmented chromosomes, and continuing unrestricted synthesis of genetic material.

77-1962. Patil, T. N.; Radhakrishnamurty, R. (Discipl. Biochem. Applied Nutr., Ctr. Food Technol. Res. Inst., Mysore, India). **Biochemical changes induced by α-naphthyl thiourea in albino rats.** *Indian J. Biochem. Biophys.* 14(1): 24; 1977.

Albino rats given alpha-naphthyl thiourea (ANTU) displayed excessive urinary excretion of albumin, inorganic phosphorus, and urea in 22 hr. Blood and pleural effusion levels of inorganic phosphorus, glucose, and creatinine were high. Progressive increases were seen in urea contents of blood and pleural effusion, with a concomitant rise in arginase activities. Blood levels of phospholipids, triglycerides, and cholesterol were significantly elevated. No changes were seen in liver cholesterol and fat contents. ^{14}C-ANTU was prepared from the precursors. High radioactivity counts were obtained in kidney and liver 4 hr after feeding the radioactive compounds to the animals.

77-1963. Gopalaswamy, U. V.; Aiyar, A. S. (Biochem. Food Technol. Div., Bhabha Atomic Res. Ctr., Bombay). **Mammalian toxicity and metabolism of lindane.** *Indian J. Biochem. Biophys.* 14(1): 36; 1977.

The toxicity and metabolism of lindane were examined in rats; toxicity was assessed in terms of the in vitro effects on the mitochondrial oxidative metabolism. The ADP/O ratio in both liver and kidney mitochondria decreased in the presence of lindane. State 3 respiration was not altered, but the insecticide stimulated state 4 respiration several fold. This resulted in a decrease in the respiratory control index. The effects were more marked with kidney mitochondria. The metabolism of lindane in rat liver in vitro results in formation of hexachlorobenzene and pentachlorophenol; when lindane is administered intraperitoneally to rats these two metabolites are recovered in the urine. Thus lindane appears to undergo aromatization and dechlorination in the mammalian body.

77-1964. Kachole, M. S.; Pawar, S. S. (Div. Biochem., Dep. Chem., Marathwada Univ., Aurangabad, India). **Effect of endrin on microsomal electron transport reactions. Part 1. Sleeping time, electron transport components and protection by pretreatment.** *Indian J. Biochem. Biophys.* 14(1): 45; 1977.

Endrin was administered orally to male rats at 2,50, 3.75, and 5.00 mg/kg body weight. After 12 hr no effects were noted on various mixed function oxidase parameters.

The amounts of liver microsomal protein and electron transport components per g of liver were significantly increased in a dose-dependent manner 108 hr after administration. The thiopentone sleeping time was reduced by 28% and pentobarbital sleeping time was reduced by 19% following injection of endrin i.p. 24 hr earlier. Four-day pretreatment of rats with phenobarbital and hexobarbital in drinking water decreased the mortality rate due to endrin. Thus endrin has a nonspecific inducing effect on rat liver mixed function oxidase.

77-1965. Bhatnagar, V. K.; Malviya, A. N. (Dep. Biochem., S. N. Med. Coll., Agra, India). **Toxic effects of pesticides on weanling rats.** *Indian J. Biochem. Biophys.* 14(1): 50; 1977.

Oral administration of malathion, DDT, or a combination of the two (58.0 mg/kg/day, 25.0 mg/kg/day, or 415 mg/kg/day respectively) for 45 days in weanling rats produced no change in physical behavior, mortality rate, or growth rate. DDT alone caused an increase in liver weight, while malathion alone did not produce this increase. The two insecticides administered in combination resulted in an increase. DDT, malathion, and a combination of the two produced hyperemia when chronically administered in all of the test rats. The serum sodium and potassium levels were also distinctly altered. A hypothesis was advanced regarding the effects of the pesticides on growth, mortality, liver and kidney weights, blood sugar, and serum electrolytes by way of the serum sodium and potassium levels.

77-1966. Nageswara Rao, T.; Subrahmanyam, D. (Dep. Biochem., Postgrad. Inst. Med. Educ. Res., Chandigarh, India). **Effect of DDT on rat adipose tissue lipolytic activity.** *Indian J. Biochem. Biophys.* 14(1): 50; 1977.

Previous reports have indicated that the increase in renal and hepatic glyconeogenesis after DDT treatment in the rat is due to an increase in adenylate cyclase activity. Most DDT in the body is stored in adipose tissue. DDT might affect the hormone-sensitive lipolysis in the adipose tissue. Rats were given DDT orally at 600 mg/kg body weight, and lipolysis was estimated in intact fat pads after 5 hr. Significant increases were found in fatty acid and glycerol release. In vitro experiments were also conducted with isolated fat cells; results from these suggested that the effect of DDT on lipolysis is mediated through cyclic AMP.

77-1967. Misra, D.; Agarwal, D. K.; Kohli, J. D. (Indust. Toxicol. Res. Ctr., Lucknow, India). **Hormonal influence on parathion toxicity.** *Indian J. Biochem. Biophys.* 14(1): 51; 1977.

The toxicity of parathion is about four times greater in female than in male rats. The possibility of hormonal control of various metabolic pathways was investigated. The degree of inhibition of cholinesterase (ChE) activity was used as a toxicity index in control, castrated, and castrated plus hormone-treated animals. Inhibition of ChE activity was greater in female than in male rats. Following castration the extent of enzyme inhibition in male rats was similar to that of females. Treatment with testosterone restored the ChE activity of castrated male rats. Estrogen produced a slight restorative effect of ovariectomized rats. Control by male hormone is presumably related to the lower toxicity of parathion to male rats than to females.

77-1968. Ramakrishna, N.; Ramachandran, B. V. (Indian Drug Res. Lab., Poona, India). **Potentiation of malathion toxicity by parathion.** *Indian J. Biochem. Biophys.* 14(1): 53; 1977.

The very low toxicity of malathion to mammals is due to its facile detoxication in liver by B-type nonspecific carboxylesterases (EC 3.1.1.1). Consequently all other organophosphates which are potential B-esterase inhibitors should be expected to synergize malathion toxicity. Parathion, although a powerful B-esterase inhibitor in vitro, has failed to produce this potentiation. In renewed studies it was concluded that parathion is a potentiator of malathion when administered in sufficient quantity to inhibit B-esterases. This was accomplished in light of the fact that the usual antidotes against organophoshates poisoning, atropine and quaternary oximes, protect only cholinesterases and not B-esterases. Parathion can be administered to animals protected with these compounds at amounts in excess of the LD50, which are sufficient to inhibit the B-esterases. In such animals the LD50 of malathion, normally 600 mg/kg in mice, is reduced to 80-100 mg/kg.

77-1969. Mukhopadhyay, P. K.; Guha, P. K.; Banerjee, S. K.; Dehadria, P. V. (Dep. Biochem., Univ. Coll. Sci., Calcutta, India). **Biochemical effects of organophosphorus insecticides in fishes.** *Indian J. Biochem. Biophys.* 14(1): 57; 1977.

Little accumulation of organophosphorus insecticides in tissues had been reported. The chronic effects of organophosphorus insecticides depend on the accumulated physiological effects of frequent exposure to nonacute doses. Toxicologic studies were performed on histological and biochemical factors resulting from exposure of air-breathing fish, *Clarias batrachus* (Linn.) to subacutely toxic doses of organophosphate insecticides. Studies were conducted on the induction of hepatic microsomal drug metabolizing systems of enzymes by organophosphorus insecticides in the light of their metabolism. Effects of these insecticides have also been reported on the activities of different lysosomal enzymes in various tissues.

77-1970. Kandasamy, D.; Chendrayan, K.; Rajukkanu, K.; Balasubramanian, M. (Pestic. Residue Res. Unit.

Tamil Nadu Agric. Univ., Coimbatore 641003, India). **On the variations in the degradation of carbofuran by three soil fungi.** *Current Sci.* 46(8): 280-281; 1977. (10 references)

Cultures of *Aspergillus niger*, *Trichoderma viride*, and *Helminthosporium* sp. isolated from garden soil at the Tamil Nadu Agricultural University Experimental farm by enrichment culture were added to Czapek medium containing carbofuran at 20 ppm. Residues of carbofuran and hydroxycarbofuran were assayed weekly. Helminthosporium degraded 70 and 77.5% of the carbofuran present during the first and second weeks, respectively, and complete degradation had occurred by the third week, according to TLC results. The rate of carbofuran degradation increased with increasing incubation time for all three fungi. All three of them produced hydroxycarbofuran. *Helminthosporium* sp., an efficient carbofuran degradation organism, converted only 21.% of the carbofuran present to hydroxycarbofuran, compared 12.0% by Aspergillus niger in the initial stage. Other degradation products were not identified.

77-1971. Ohta, T.; Kuhr, R. J.; Bowers, W. S. (Dep. Entomol., New York State Agric. Exper. Stn., Geneva, NY 14456). **Radiosynthesis and metabolism of the insect antijuvenile hormone, Precocene II.** *J. Agric. Food Chem.* 25(3): 478-481; 1977. (9 references)

The antijuvenile hormone precocene II (6,7-dimethoxy- 2,2-dimethylchromene) was radiosynthesized with carbon-14 in the 2-*gem*-dimethyl position. Injection of the labeled compound into nine insect species revealed a variation of at least 37-fold in metabolic rate. In vitro studies using cabbage looper and European corn borer gut and fat body tissue homogenates indicated that the metabolic pathway was primarily dependent on catalysis by a mixed-function oxidase system. The principal metabolite in each insect was 6,7-dimethoxy- 2,2-dimethylchroman- 3,4-diol which was readily conjugated in vivo. Other identified metabolites include 6,7-dimethoxy- 2,2-dimethylchroman-3-ol and 3,4-epoxy-6,7-dimethoxy- 2,2-dimethylchroman. (Author abstract reprinted by permission of the American Chemical Society)

77-1972. Craig, F. N.; Cummings, E. G.; Sim, V. M. (Biomed. Lab., Edgewood Arsenal, Aberdeen Proving Ground, MD). **Environmental temperature and the percutaneous absorption of a cholinesterase inhibitor, VX.** *J. Invest. Dermatol.* 68(6): 357-361; 1977. (15 references)

VX is a liquid anticholinesterase agent of low volatility, chemical formula *S*-(2-diisopropylaminoethyl) O-ethyl methylphosphonothioate. To test the effects of environmental temperature on percutaneous absorption, this compound was applied to the skin of 139 male volunteers at environmental temperatures of -18°, 2°, 18°, or 46°. After 3 hr the skin was decontaminated with sodium hypochlorite, and the men spent the next 21 hr at 27°C. The quantity of VX penetrating the skin was estimated from the red blood cell cholinesterase inhibition. The decimal fraction of the dose that penetrated in 3 hr ranged from 0.04 at -18°C to 0.32 at 46°C for the cheek and from 0.004 at 8°C to 0.029 at 46°C for the forearm. Cholinesterase inhibition continued to increase after decontamination, apparently due to deposition of VX in the skin. The amount of VX remaining in the skin after decontamination was greater at higher temperatures in the forearm and less in the cheek.

77-1973. Butcher, L. L.; Marchand, R.; Parent, A.; Poirier, L. J. (Lab. Neurobiol., Pavillon Notre-Dame, Quebec, Canada). **Morphological characteristics of acetylcholinesterase-containing neurons in the CNS of DFP-treated monkeys. Part 3: Brain stem and spinal cord.** *J. Neurol. Sci.* 32(2): 169-185; 1977. (29 references)

The distribution of acetylcholinesterase (AChE) was studied in the lower brain stem and spinal cord of 4 monkeys following the i.m. administration of DFP. In one animal that received 0.43 mg/kg DFP 4 hr prior to death, AChE was virtually absent in all structures. In the other 3 animals sacrificed at 10, 12, and 18 hours after injection of 0.20 mg/kg, AChE activity was notably slighter in the neuropil of different structures normally displaying a moderate to intense AChE activity. By studying the monkeys which received the 0.20 mg/kg dose of DFP, the morphological characteristics noted concerning the AChE neurons in the monkey CNS suggest that it is possible that the pattern of distribution of AChE may permit the identification of functionally related groups of neurons.

77-1974. Ohkawa, H.; Kaneko, H.; Miyamoto, J. (Research Dept., Pesticides Div., Sumitomo Chem. Ind. Co., Ltd., Takarazuka, Hyogo, Japan). **Metabolism of permethrin in bean plants.** *J. Pestic. Sci.* 2(1): 67-76; 1977. (7 references)

The residue levels and metabolism of the *trans*- and *cis* isomers of permethrin following application to the leaf surface of bean plants were studied. The chemicals were rapidly metabolized in the plants. The half-life was about 7 days and 9 days, resp., for the *trans* and *cis* permethrin. Both isomers underwent ester cleavage, oxidation at the phenoxy group of the alcohol and probably at the geminal dimethyl group in the acid, and conjugation of the resulting carboxylic acids and alcohols. The major metabolites derived from the alcohol moiety were glucosides of 3-phenoxybenzyl alcohol, 3-(2'-hydroxyphenoxy) benzyl alcohol and 3-(4'-hydroxyphenoxy) benzyl alcohol, and those derived from the acid moiety were glucosides of 3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid and probably its hydroxylated derivatives. Both isomers and their metabolites moved only slightly from the application site to other parts of the plants.

77-1975. Miyamoto, J.; Keplinger, M. L.; Wingender, R. J.; Takimoto, Y.; Jenkins, D. H. (Research Dept., Pes-

ticide Div., Sumitomo Chem. Ind. Co. Ltd., Takarazuka, Hyogo, Japan). **Residue study with cyanofenphos in milk and meat following the subacute feeding to dairy cattle.** *J. Pestic. Sci.* 2(1): 1-5; 1977. (9 references)

A study was conducted to determine whether feeding of cyanofenphos to dairy cows results in a measurable amount of residues of the compound and its toxic metabolites in milk and meat from the animals. The cows were fed 0, 5, 15, and 50 ppm cyanofenphos in their diets for 30 days. Only at the 50 ppm level did milk from the cows contain residues. The highest level of cyanofenphos (0.25 ppm) occurred at days 2 and 4. The oxon level (0.06 ppm) peaked at day 4. The concentration of both compounds decreased thereafter, and after 30 days of feeding the residue levels of cyanofenphos and cyanofenphos-oxon were less than the detection limits. The 50 ppm treatment for 30 days resulted in residues of 0.9 ppm cyanofenphos and 0.09 ppm cyanofenphos-oxon on an average in the fat of the animals, whereas other tissues generally contained one tenth these amounts. At the lower dosages any detectable amounts of cyanofenphos or its oxon were hardly observed at all. At day 60, trace amounts (0.005 ppm) of cyanofenphos were sporadically detected in the tissues.

77-1976. Desi, I.; Dura, G.; Szlobodnyik, J.; Csuka, I. (Natl. Inst. Hygiene, Budapest, Hungary). **Testing of pesticide toxicity in tissue culture.** *J. Toxicol. Environ. Health* 2(5): 1053-1066; 1977. (32 references)

An attempt was made to assess the toxicity of different pesticides based on their in vitro effect in tissue culture and to relate the findings to earlier in vivo experiments. The primary monkey kidney cell line maintained in continuous culture was used. The pesticides studied included chlorinated hydrocarbons such as lindane and DDT, organic phosphates such as malathion, bromophos, and trichlorfon, and carbamates such as propoxur, dioxacarb, and benomyl. Lindane produced cell damage to 100 ppm, DDT at 50 ppm. Malathion or bromophos at 50 ppm caused strong damage. Trichlorfon affected cell growth only one applied at 200 ppm. Dioxacarb had the strongest cytotoxicity of the carbamate pesticides, 10 ppm. Treatment with propoxur or benomyl at 250 ppm retarded cellular growth. Lindane produced a cytotoxic effect when the culture was exposed to 250 ppm, as did DDT at 100 ppm and malathion and bromophos at 50 ppm. The cytotoxic doses of the carbamate pesticides varied from 50 to 250 ppm.

77-1977. Highman, B.; Gaines, T. B.; Schumacher, H. J. (Dept. Pathol., Univ. Arkansas, Little Rock, AK). **Retarded development of fetal renal alkaline phosphatase in mice given 2,4,5-trichlorophenoxyacetic acid.** *J. Toxicol. Environ. Health* 2(5): 1007-1018; 1977. (11 references)

To determine a possible retardation in renal alkaline phosphatase or functional development due to 2,4,5-T, maternal mice were given by gavage 60-120 mg/kg on days 6-14 of pregnancy. At necropsy on day 17, the fetal kidneys were excised and fixed 24 hours in cold 65% ethanol. Paraffin sections (stained) revealed alkaline phosphatase mainly in tubules in the inner renal cortex. Fetal kidneys showing diminished or no alkaline phosphatase were designated subnormal. There was a statistically significant greater incidence of subnormal fetal kidneys in the 2,4,5-T-treated mice than in controls. In three experiments some mice were also sacrificed on day 18, and the incidence of subnormal fetal kidneys was significantly lower than on day 17. This retardation in renal alkaline phosphatase development indicates a retardation in renal functional development and indirectly supports the view that 2,4,5-T also retards the morphological development of the fetal kidney and is not a renal teratogen in mice. It also illustrates that selected histochemical studies may help in teratogenic investigations.

77-1978. Davis, J. E.; Cranmer, M. F.; Peoples, A. J. (Health Effects Res. Lab., EPA, Wenatchee, WA). **Effects of diphenylhydantoin and chloroquine on monkey liver microsomal mixed-function oxidases.** *J. Toxicol. Environ. Health* 2(5): 1193-1199; 1977. (18 references)

The possible effects of chloroquine on the induction of monkey liver mixed-function oxidases, using the common anticonvulsant diphenylhydantoin as the inducing agent, were investigated. Sixteen adult male squirrel monkeys (*Saimiri sciureus*) were randomly divided into three treatment groups and one control group. Each treatment group received 10 mg/kg oral doses of diphenylhydantoin and/or chloroquine. Following sacrifice, in vitro assays for activity of liver microsomal mixed-function oxidase were run. The assays confirmed diphenylhydantoin as a potent inducer of mixed-function oxidases. Chloroquine administration had little effect on the enzymes assayed and did not inhibit the diphenylhydantoin induction. These data were then applied to reports of abnormal retention of DDT and DDE in Haitian spraymen who, at the time of their exposure to DDT were taking chloroquine on a regular basis. The data from this current study do not support the conjecture that chloroquine was inhibiting the induction, by DDT or its metabolites, of liver microsomal mixed-function oxidases in the spraymen.

77-1979. Freudenthal, R. J.; Kerchner, G. A.; Persing, R. L.; Baumel, I.; Baron, R. L. (Battelle, Columbus Labs., Columbus, OH). **Subacute toxicity of ethylenebisisothiocyanate sulfide in the laboratory rat.** *J. Toxicol. Environ. Health* 2(5): 1067-1078; 1977. (12 references)

Ethylenebisisothiocyanate sulfide (EBIS) was given in the diet to rats at 0, 1, 10, 100, and 1,000 ppm for up to 90 days. Rats receiving EBIS at 1,000 ppm showed toxic response within 8-14 days as a reversible paralysis of the hind legs. When left on the 1,000 ppm diet, the animals soon died. On removing them from this diet, they recovered, only to become ataxic on further dietary exposure at the high level. No histologic lesions were found in the

brain, spinal cord, or peripheral nerves taken from the paralyzed animals. These findings suggest a biochemical (reversible) rather than somatic lesion. Ingestion of 1,000 ppm EBIS for 7 days caused measurable changes in thyroid function. Total serum thyroxine levels were markedly decreased, as was iodide uptake by the thyroid. Ingestion at levels of 100, 10, 1, and 0 ppm for 90 days produced no observable adverse effect. Growth, diet consumption, and thyroid function were normal. No EBIS-related lesions were detected during the histopathologic evaluation of major tissues and organs taken from rats fed 100 ppm EBIS or control diets. Thus no observable effects were noted in animals receiving 100 ppm in the diet, an amount equivalent to an average intake ranging from 67 mg/kg at week 1 to 31 mg/kg at week 12.

77-1980. Fabacher, D. L.; Hodgson, E. (Dept. Entomol., North Carolina State Univ., Raleigh, NC). **Hepatic mixed-function oxidase activity in mice treated with methylated benzenes and methylated naphthalenes.** *J. Toxicol. Environ. Health* 2(5): 1143-1146; 1977. (7 references)

The capacity of methylated benzenes and methylated naphthalenes to induce hepatic mixed-function oxidase enzymes in the livers of treated mice was investigated. Eight methylated benzene and five methylated naphthalene compounds were injected into adult male mice, i.p., daily for 3 days. On the fourth day livers from control and treated mice were compared with regard to weight, microsomal N- and O-demethylase activity, and various spectral characteristics of microsomal cytochrome P-450. Three methylated benzenes and one methylated naphthalene produced significant increases in liver weight/body weight ratios, O-demethylation of p-nitroanisole, N-demethylation of aminopyrine, or a combination of these. This data could be of significance to environmentally concerned farm workers and fomulators since some methylated benzenes and naphthalenes, known to be components of pesticide formulations, induce enzyme activities responsible for the metabolism of foreign and endogenous compounds.

77-1981. Hattori, J. (Pesticides Division, Sumitomo Chem. Ind. Co., Ltd. Takarazuka, Hyogo, Japan). **Sumilex (sumisclex), N-(3′,5′-dichlorophenyl)-1,2-dimethylcyclopropane-1,2- dicarboximide, a fungicide.** *Japan Pestic. Inform.* 29:16-18; 1977. (1 reference)

Sumilex, (dichlozoline) a compound with outstanding activity against *Botrytis* and *Sclerotinia* diseases, has been screened for fungitoxic activity. The results of the study suggest that Sumilex is a very promising fungicide for use on various crops in several countries. Intensive toxicological studies on acute and chronic toxicity and other tests have not shown any adverse effects on mammals. Orally administered Sumilex in rats was readily adsorbed and excreted rapidly and completely within a few days, mostly by the urine. Sumilex can be marketed without problems and is expected to be well accepted by farmers, especially by vine growers encountering problems with resistant fungus diseases.

77-1982. Parry, J. M. (Dep. Genet., Univ. Coll. Swansea, Swansea SA2 8PP, Wales). **The use of yeast cultures for the detection of environmental mutagens using a fluctuation test.** *Mutat. Res.* 46(3): 165-176; 1977.

A microbial fluctuation test, modified for the detection of environmental mutagens, has been evaluated using a number of strains of the yeast *Saccharomyces cerevisiae*. Auxotrophic diploid cultures of yeast which produce prototrophic colonies by both mitotic gene conversion and mutation have been extensively utilized for the detection and evaluation of chemicals showing genetic activity. A number of the yeast strains utilized were shown to be suitable for use in the fluctuation test although the time scales of the experiments were considerably extended (up to 16 days) compared to those involving bacteria. The yeast strains respond to doses of mutagens at least 100-fold lower than that required in a conventional short exposure treat and plate experiment. In experiments involving the induction of mitotic gene conversion at the tryptophan-5 and histidine-4 loci in the fluctuation test significant increases in prototrophic cells were produced in the presence of the insecticide Lindex (lindane, 0.05 μg/ml), the preservative Thiomersal (0.0001 μg/ml), a mahogany hair dye (0.01 μg/ml), the herbicide paraquat (0.02 μg/ml) and the alkylating agent ethyl methane sulphonate (0.1 μg/ml). The results demonstrate that the fluctuation test provides an extremely sensitive assay for the detection of chemicals which show genetic activity in yeast at non-toxic concentrations. (Author abstract by permission)

77-1983. Klinger, W. (Inst. Pharmacol. Toxicol., 69 Jena, DDR). **Modifying effects of environmental chemicals on drug metabolism.** *Mutat. Res.* 46(3): 193-194; 1977.

Each test for mutagenicity comprises two components, a metabolizing system and a response system. An effective metabolizing system is necessary because the majority of mutagens are primary mutagens (premutagens) and require biotransformation to active metabolites, in order to mediate their effects. The metabolizing system thus may be rate limiting for the whole test system. Biotransformation may be hepatic (highest activities) or extrahepatic (lung, kidney, intestine, other tissues). Phase I reactions (hydroxylation, reductions, hydrolysis) result in general in reactive metabolites, and phase II reactions (mainly conjugation reactions) result in general in water-soluble non-toxic metabolites. Genetic factors influence the metabolic pattern and its response to environmental chemicals. More than 200 compounds are known to stimulate these reactions by enzyme induction (by protein de novo synthesis) or prolongation of enzyme half life time or both. Among them are sedatives, hypnotics, anticonvulsants, neuroleptics, ataractics, antihistaminics, antiphlogistics, antidiabetics, different types of insecticides,

herbicides, ingredients of plastic materials, constituents of oils, tar, smoke, and so on. The inducing power and the induction patterns differ widely. Most of these inducers are also potent inhibitors of different phase I or/and phase II reactions. There is no correlation between the acute inhibitory and the following stimulating activity. Different types of inducers are known: most often the phenobarbital type is observed with increased liver weight, microsomal protein content, NADPH cyt P-450 reductase activity and cyt P-450 concentration. Polycyclic hydrocarbons stimulate nearly selectively the synthesis of a special cyt P-450 species, cyt-450, or cyt P-448, as the CO complex of the reduced form has a maximum absorption band at 448 nm. Finally there are the TCDD and amine type. The duration of the induction effect differs between 1 week and several months. (Author abstract by permission, abridged)

77-1984. Degraeve, N.; Moutschen, J.; Moutschen-Dahmen, M.; Gilot-Dehalle, J.; Houbrechts, N.; Colizzi, A. (Lab. Genet., Univ. Liege, Belgium). **Cytogenetic and genetic effects of phosan-plus.** *Mutat. Res.* 46(3): 204; 1977.

Phosan-plus, a mixture of three insecticides: methoxychlor and two organophosphates dimethoate and malathion, was tested in male mice after one single I.P. injection (30 mg/kg). Cytological damage was analyzed in bone marrow during the first three days after injection and in testis, at intervals ranging from 12 h to 44 days. Slight chromosome breakage was observed in spermatogonia especially after 24 and 48 h. However, the chromosome damage did not result in increased frequency of sperm anomalies at 40 to 44 days after injection. Observation of diakinesis from 11 to 16 days did not reveal significant cytological damage. Tests on bone marrow, namely frequency of polychromatic erythrocyte micronuclei and chromosome breakage, were not significant during the first three days after injection. Dominant lethals were investigated for testing the sensitivity of pre-, post- and meiotic stages. No enhancement over the control was observed. The effects of Phosan-plus were also analyzed in relation to its toxicity after treatment of *Schizosaccharomyces pombe*, strain ade 7-C8. There was no increase of the number of revertants with and without addition of microsomal fraction. Our results are in general agreement with data of the literature obtained with the compounds tested individually. The bearings of these results for human hazards will be discussed.

77-1985. Egert, G.; Parlar, H.; Greim, H. (Inst. Toxicol. Univ., D7400 Tubingen, Germany). **Formation of promutagens from the herbicides pyrazon and chlorthiamid in the presence of nitrous acid.** *Mutat. Res.* 46(3): 217-218; 1977.

Residues of pesticides and nitrite in human food may be a health hazard to man since many pesticides carry secondary and tertiary amino groups, which are known to form mutagenic and carcinogenic nitroso-compounds in the presence of nitrite under conditions resembling those in the human stomach (Lijinsky, *Cancer Res.* 34 (1974) 255; Egert, Greim, *Fd. Cosmet. Toxicol* 14 (1976) 193. However, there is little information on the ability to react with nitrous acid of chlorinated pesticides which contain amino groups differently bound to the molecule. For example, in the herbicides pyrazon (1-phenyl-4- amino-5-chlorpyridazone) and chlorthiamid (2,6-dichloro- thiobenzamide) the amino groups are in the α-position to the C=C double bond or to the C=S double bond, respectively. It became of interest therefore which reaction products are formed for these pesticides and which biologic activities result from this interaction. In the presence of 10m*M* Na-thiocyanate and 0.1 *M* Na-nitrite at pH 1, 10 mM Pyrazon reacts to *n*-methyl- nitroso-aniline in a yield of 6%, whereas Chlorthiamid reacts to the rearrangement product 2,6-dichloro-*N*-phenyl- isothiocyanate in a yield of 43%. Quantitative analysis of the reaction products has been performed by chlorimetric spectroscopy as described by Eisenbrand and Preussmann (Arzneim.-Forsch. 10 (1970) 1513) and by 1-H-NMR spectroscopy. Qualitative analysis was based on IR-and GC-mass-spectroscopy. Mutagenicity of the parent herbicides and the reaction products was tested using *E. coli* K-12 (343/113) as target cells in an in vitro system including mouse liver microsomes for metabolic activation. Whereas pyrazon and chlorthiamid were not mutagenic under any conditions, the derivatives of both induced mutations to the tester strain in the presence of metabolically active liver microsomes.

77-1986. Kappas, A. (Biol. Dep., Democritus Nuclear Res. Ctr., Athens, Greece). **Genetic effects of fungicides through metabolic activation in *Aspergillus nidulans*.** *Mutat. Res.* 46(3): 224; 1977.

A number of fungicides which were previously found not to affect the genetic stability of *Aspergillus nidulans* heterozygous diploid strains were tested again in the same system by using the metabolic activation technique. Microsomal preparations from rats together with proper cofactors were added into the culture medium with or without the fungitoxicants. Scoring for color sectors showed that one of the tested fungicides, namely Daconil (chlorothalonil, tetrachloroisophthalonitrile), a member of the aromatic hydrocarbon group increased the somatic segregation of the diploid strain of the fungus by a factor of six. It is interesting to note that this fungicide was the only one out of a number of the aromatic hydrocarbons tested previously without microsomes which did not show any effect in *Aspergillus* (*Phytopathology*, 66 (1976) 217-220).

77-1987. Pohlheim, E.; Pohlheim, F.; Gunther, G. (Lehrst. Bot., Bot. Garten, Paedagog, Hochsch. Karl Liebknecht, Potsdam, DDR). **Mutagenicity testing of herbicides with a haploid pelargonium.** *Mutat. Res.* 46(3): 232; 1977.

The monohaploid Pelargonium zonale "Kleiner Liebling" (2n = x = 9) was taken for mutagenicity tests with a flower plant. Recessive mutations may already

occur on the treated plant. Uniform clone material was available through cutting propagation. The shoots were marked at the site of the second visible internodium (seen from the tip of the shoots). Thus parts of the leaves may be compared that had a similar stage of development at the time of the treatment. One drop of the solution was applied to the terminal bud. The results of the treatment were evaluated after ten to twelve weeks. The number of separate chlorophyll defects and/or tissue areas showing growth inhibition was taken as a measure of occurrence of mutagenic changes. Criterioa of mutation are the continuity of the altered cell descendence and their transitional areas that should be expected on the basis of cell division during the histogenesis next to the intact issues. Mutated areas were counted on the third and fourth newly formed leaves which developed after treatment. The leaves existed as small primordials at the time of the treatment. Thus chimeroids (developing after extra-apical mutation) and no chimeras (developing after apical mutation) were counted. Twenty-five herbicides were tested at a concentration of 10^{-3}M. Eight of them (lanacil, propachlor, chlorflurazol, diuron, atrazin, bromoxynil, pyrazon, methabenzthiazuron) did not show any difference in terms of mutagenic influence compared to the controls. Ten of the herbicides tested (suffix, TCA, simazine, 2,4-DBN, MCPB, Diquat, Dalapon, Monolinuron, 2,4-D, DNBP) brought about a slight yet statistically valid increase in the mutation rates compared to the controls. A strong mutagenic influence could be observed in the test with amitrole, chlorpropham carbyne, Triallate, diallate and prophem. In these cases the mutation rates were six to eight times higher than in the controls. The mutagenic influence of amitrole and CIPC was equal to the influence of an X-ray treatment of 500 R. (Author abstract by permission)

77-1988. Szende, K. (Dep. Microbiol., Inst. Soil Sci., Budapest, Hungary). **Genetic variability in a bacterial population: effect of mutagens and selection.** *Mutat. Res.* 46(3): 238-239; 1977.

For the demonstration of the environmental effects (increased mutation pressure and selection) on genetic populations the use of bacterial model systems are profitable. In the experiments presented here the effect of a single mutagen treatment (NG, EMS, captan) was followed for more than 50 generations in a *Rhizobium meliloti* strain. The treated lines, originated from a single cell, were exposed to a paraquat containing medium, the stress environment, during the selection period. From time to time the lines 5-5 clones were isolated randomly and these were submitted for growth rate determinations in normal and stress media (r_1). The growth rates were expressed as the time necessary for the doubling of biomass and were compared with the original, refrigerated control line (r_2), and the relative fitness values ($W = r_1/r_2$) calculated. From the obtained data follows: (1) the fitness of the non mutagenized cells in normal and stress environment decrease; (2) the fitness of mutagenized cells in normal environment decreases also, becoming expressive at the end of the selection period; (3) the fitness of mutagenized cells in stress environment does not show any decrease. In the non mutagenized cells there is a constant accumulation of deleterious variability (it is not excluded that the main reason for the accumulation of the detrimental "spontaneous" changes is the paraquat itself; its cytogenetic effect only in higher plants was demonstrated, however). In the case of induced variability, viz. after mutagen treatment the variability in fitness of cells increases to a higher extent. As a result of this, adaptively useful mutations accumulate, and the population is able to compensate the detrimental effects of the stress environment. (Author abstract by permission)

77-1989. Venitt, S.; Bushell, C. T. (Royal Cancer Hosp., Pollards Wood Res. Stn., Chalfont St. Giles, Bucks, HP8 4SP, England). **Mutagenicity of acrylonitrile in bacteria.** *Mutat. Res.* 46(3): 241; 1977.

Acrylonitrile (ACN) is produced on an industrial scale and is widely used in the rubber and plastics industries, and as a grain fumigant. It is selectively toxic to the nervous systems of man and animals. In view of its structural similarity to vinyl chloride (a known mutagen and carcinogen) ACN was tested for mutagenicity in bacteria as a rapid means of determining its genotoxic potential. ACN was mutagenic in various DNA-repair strains of *E. coli* WP2, causing trp- trpreversions. These effects were weak in plate incorporation tests, but assays using a simplified fluctuation test showed ACN to be significantly mutagenic at doses 20-40 times lower than those giving significant results in the plate tests. Use of the different DNA-repair strains indicated that ACN causes DNA damage of the type exemplified by methyl methanesulfonate, i.e., non-excisable mis-repair damage. (Author abstract by permission)

77-1990. Bignami, M.; Cardamone, G.; Comba, P.; Ortali, V. A.; Morpurgo, G.; Carere, A. (Inst. Super. Sanit., Rome, Italy). **Relationship between chemical structure and mutagenic activity in some pesticides: the use of *Salmonella typhimurium* and *Aspergillus nidulans*.** *Mutat. Res.* 46(3): 243-244; 1977.

The mutagenicity of several chemicals (trichloroacetic acid, acrolein, allyl alcohol, barban, dibromoethane, dichloroethane, dichloropropane, hexafluoropropanol, ethylene glycoe, dichloropropane-dichloropropene mixture, sulfallate, carbon tetrachloride) was tested in two different systems. The in vitro mutagenicity test described by McCann et al. (Proc. Nat. Acad. Sci., 2 (1975) 979-983), employing *S. typhimurium* strains TA1535 and TA100 (induction of base substitutions) and strains T1538 and TA98 (induction of insertions and deletions), showed sulfallate, dibromoethane, dichloropropane and dichloroethane to be definite mutagens in strains TA 1535 and TA100, while acrolein is active in strains TA1538 and TA98. Induction of point mutations

(8-azaguanine resistance) and somatic segregation (crossing over and non-disjunction) were studied in *A. nidulans*, using the spot test technique with the aid of blotting paper triangles (Bignami et al., Mutation Res., 26 (1974) 159-170). MNNG and 5-FU were used as standard mutagens and recombinogens. Sulfallate, dibromoethane, and dichloropropane were shown to raise the frequency of mutants resistant to 8-AG to significant levels; sulfallate also proved to be a powerful recombinogen. The discussion concerns some aspects relative to a possible relationship between chemical structure and genetic activity in some pesticides. (Author abstract by permission)

77-1991. Kurtz, P. J. (Army Environ. Hyg. Ag., Aberdeen Proving Ground, MD). **Behavioral and biochemical effects of 4-benzothienyl-*N*-methylcarbamate (Mobam, trade mark).** *Natl. Tech. Inform. Serv.* AD-A021,681, 1975, 19 p.

Decreases in rat plasma, erythrocyte and brain cholinesterase levels after intraperitoneal injection of 1 to 5 mg/kg of 4-benzothienyl-*N*-methylcarbamate (mobam), were compared with decrements in spontaneous motor activity and changes in performance of a rapidly acquired conditioned avoidance response produced by this compound. Significant effects were observed with all five measures at dosages producing no obvious clinical signs. A dosage of 2 mg/kg significantly depressed plasma and erythrocyte cholinesterase activity and decreased motor activity 15 minutes after injection. Higher dosages (2.5 to 5 mg/kg) significantly depressed brain cholinesterase activity and avoidance performance. (Author abstract by permission)

77-1992. Rubinstein, R.; Cuirle, E.; Cole, H.; Ercegovich, C.; Weinstein, L. (Franklin Inst. Res. Labs., Philadelphia, PA). **Test methods for assessing the effects of chemicals on plants.** *Natl. Tech. Inform. Serv.* PB-248,198, 1975, 246 p.

The report is the result of a survey undertaken to develop a series of acceptable test protocols for assessing the effects of chemicals on plants. Plant exposure to air, soil, and water contaminants were considered. Test species were selected on the basis of physiology, anatomy, importance as crops, and their susceptibility to chemicals. Bioassay methods were chosen because they are most representative of natural conditions. The recommended sequence of test procedures includes: growth chamber or laboratory testing, greenhouse testing, field plot testing, and progeny testing. Finally, the extent of testing should depend upon the quantity of the chemical to be manufactured and its potential hazard to the environment. (Author abstract by permission)

77-1993. Mayer, F. L., Jr.; Mehrle, P. M., Jr.; Dwyer, W. P. (Fish- Pestic. Res. Lab., Duluth, MN). **Toxaphene effects on reproduction, growth and mortality of brook trout.** *Natl. Tech. Inform. Serv.* PB-249,303, 1975, 51 p.

Yearling brook trout (*Salvelinus fontinalis*) were continuously exposed to toxaphene (0, 39, 68, 139, 288, and 502 ng/l) in a flow-through diluter system. Day length and water temperature were altered monthly to correspond to natural conditions. Adult growth was reduced in the 288 and 502 ng/l toxaphene exposures, and the added stress of spawning activities caused extensive mortalities in these concentrations. The numbers of eggs spawned and percent viability were inversely related to increasing toxaphene concentrations. All groups of fry exposed to toxaphene had reduced rates of growth and survival. Biochemical investigations on fry backbones demonstrated that bone collagen may be a sensitive indicator of normal and abnormal growth and development prior to being observed in the whole fish. Toxaphene was accumulated by brook trout 5,000 to 76,000 times that in the water and the more chlorinated isomers of toxaphene were preferentially stored. (Author abstract by permission)

77-1994. Ragland, W. L. (Poultry Dis. Res. Ctr., Georgia Univ., Athens, GA). **Effect of duck hepatitis virus on pesticide toxicity.** *Natl. Tech. Inform. Serv.* PB-249,351, 1976, 73 p.

The report presents the results of an investigation into the effect of viral replication on hepatic endoplasmic reticulum on the activities of the microsomal drug-metabolizing enzymes of liver. Two viruses which replicate on hepatic endoplasmic reticulum without producing hepatic disease were used. They were Newcastle disease vaccinial virus in chickens and duck hepatitis virus in adult ducks. The microsomal enzymes assayed were ethylmorphine *N*-demethylase, aryl hydrocarbon hydroxylase and aniline hydroxylase. The soluble enzyme, nitroreductase, also was assayed in chickens. Pesticide residue analysis was used to evaluate indirectly the microsomal enzymatic conversion of DDT to DDD and the soluble enzymatic conversion of DDT to DDE in ducks. Viral replication did not increase the activities of the microsomal enzymes and may have decreased the activities slightly. Although the microsomal enzymes were induced to greater levels by viral replication, pesticide residue analysis failed to demonstrate increased clearance of residues from body tissues. (Author abstract by permission)

77-1995. Narahashi, T. (Dep. Physiol. Pharmacol., Duke Univ. Med. Ctr., Durham, NC). **In-vitro screening methods evaluating the neurotoxic potential of pesticides.** *Natl. Tech. Inform. Serv.* PB-249,352, 1976, 47 p.

The abdominal nerve cord preparation isolated from the crayfish is far superior to the frog neuromuscular and crayfish neuromuscular preparations for evaluation of neurotoxicity of various pesticides and other environmental agents. Neurotoxicity is manifested as stimulation and/or paralysis of spontaneous discharges of the nerve cords. The techniques involved in this experiment are rather simple, and require only reasonable amounts of

conventional electrophysiological equipment. Thus such toxicity evaluation can be performed with a modest amount of expense. More sophisticated and efficient data acquisition systems could be developed using basically the same techniques. (Author abstract by permission)

77-1996. Fukuto, T. R. (Dep. Entomol., California Univ., Riverside, CA). **Chemistry and mode of action of insecticides.** *Natl. Tech. Inform. Serv.* PB-249,669, 1976, 333 p.

The report summarizes research accomplishments for the period January 1, 1971 to September 1, 1975. The study is concerned with the intoxication and detoxication processes which take place when an animal or plant is exposed to different organic insecticides. Progress in the following general areas is reported: insecticide selectivity; insecticide metabolism; inhibition of the cholinesterase enzymes; chemical reaction involving carbamate and organophosphorus esters; insecticide penetration and its relation to resistance; neurophysiological studies on insecticide mode of action. (Author abstract by permission)

77-1997. Sakai, A.; Tanimura, A. (Dep. Food Additives, Natl. Inst. Hyg. Sci., Tokyo, Japan). **Studies on *N*-nitroso derivatives of *N*-methylcarbamate insecticides. II. Kinetical studies on the *N*-nitrosocarbamate formation from 3-methylphenyl *N*-methylcarbamate or 3,4-dimethylphenyl *N*-methylcarbamate and sodium nitrite.** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(2): 170-175; 1977. (27 references)

The formation of nitroso-carbamates from sodium carbamate and *N*-methylcarbamate insecticides was examined. The insecticides used were MTMC (3-methylphenyl *N*-methylcarbamate) and MPMC (3,4-dimethylphenyl *N*-methylcarbamate). The initial rates of NO-MTMC formation were proportional to the sodium nitrite and MTMC concentrations in the range of 2.5-10 m*M* of MTMC and 25-100 m*M* sodium nitrite at pH 2.0 and 37° in aqueous solution. With increasing acidity of the reaction mixture the initial rates of nitrosocarbamate formation increased. The formation rate was practically proportional to the hydrogen ion concentration from pH 3 to pH 1.5. The initial rate of NO-MPMC formation was 1.1 times the rate for NO-MTMC at pH 2.0 and 37°C in 20% dimethyl sulfoxide.

77-1998. Yamamoto, K.; Yamamoto, T. (Sch. Legal Med., Fac. Med., Kyoto Univ., Kyoto, Japan). [**Relation between the acid-base equilibrium of blood and duration to death of rat in intoxication due to hydrocyanic acid.**] *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 31(2): 78; 1977. (Japanese)

Wistar rats weighing 200 g were killed by oral administration of 10 ml/kg of aqueous sodium cyanide (with cyanide ion concentration ranging from 7 to 20 mg/kg) or by suffocation with nitrogen gas. The time required for respiratory standstill with cyanide ranged from 2.4 to 14 min, and with nitrogen ranged from 2.3 to 9.3 min. The *P*(oxygen) was far lower in the case of nitrogen. The concentration of hydrogen ions (calculated from the pH) was higher in both cases as the time required to death was longer. The increase of hydrogen ion concentration assumed was to be due to the accumulation of lactic acid. The concentration of blood bicarbonate ions decreased as the survival time increased.

77-1999. Yamamoto, K.; Yamamoto, T. (Sch. Legal Med., Fac. Med., Kyoto Univ., Kyoto, Japan). [**Comparison of death by intoxication due to oral and inhalation administration of hydrocyanic acid with particular reference to cyanide ion and gases in blood.**] *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 31(2): 78-79; 1977. (Japanese)

Wistar rats weighing 200 g were killed by oral administration of 10 ml/kg of aqueous sodium cyanide (with cyanide ion concentration ranging from 7 to 20 mg/kg) or by exposing them to hydrogen cyanide evolved from sulfuric acid and sodium cyanide. The survival time was 2-23 min after p.o. administration and 2-6.5 min by inhalation; the partial pressure of oxygen and carbon dioxide in the blood showed a difference between the methods of administration. The cyanide concentration was much higher in case of p.o. administration. The same phenomena were found in rabbits. It appeared that cyanide ion was transferred to the heart by the heart beat, which continued after respiratory standstill, and cyanide ion diffused from the stomach. Rapid death in the case of swallowing aqueous sodium cyanide on an empty stomach is assumed to be due to the translocation of cyanide ion into the blood by diffusion, which causes paralysis of the respiratory center.

77-2000. Varela, G.; Andujar, M.; Navarro, M. P. (Inst. Nutr., Consejo Superior de Invest. Cientificas, Campus Fac. Vet., Madrid, Spain). **Influence of dieldrin on the production and characteristics of the egg and utilization of calcium and phosphorus in the quail (*Coturnix coturnix japonica*).** *Proc. Nutr. Soc.* 35(3): 144A-145A; 1976. (3 references)

Adult quails (*Coturnix coturnix japonica*) were fed for 48 days on a diet of 32.4 grams calcium and 7.2 grams per kilogram body weight to which was added 20 mg dieldrin per kilogram. During the last 8 days measurements were taken of overall calcium and phosphorus balance, mineralization of the femur, and production and characteristics of the egg. The total number of eggs was not affected significantly, but the treated animals did show a significant decrease in egg production towards the end of the first month. The weight, size, and resistance of the shell were not affected, but the structure and calcium content were. In the female, the elimination of calcium by way of the excreta and eggs was decreased. Food intake was not affected, and therefore a significant increase in calcium retention occurred, causing an increase in the calcium and phosphorus content of the femur. In males

calcium and phosphorus depositions in the femur did not change. No significant modifications of phosphorus utilization were detected.

77-2001. Drew, E. A.; Anderson, J. R. (Imperial Chem. Ind., Ltd., Bracknell, Berks, England). **Studies on the survival of algae added to chemically treated soils. I. Methodology.** *Soil Biol. Biochem.* 9(3): 207-215; 1977. (11 references)

A modification was made to Tchan's technique for the direct enumeration of soil algae and a method is described of supplementing soils with terrestrial algae in order to study their survival in chemically-treated soil. The modifications used were the use of a mercury vapor u.v. light source for microscopy and a specially designed hemocytometer slide. These modifications increased the intensity of fluorescence of algal cells, facilitated accurate estimation of numbers in soil, and enabled transmitted or incident light systems to be used equally successfully. The use of four different soils indicates that the method of seeding soils with algae and counting them by direct microscopy can be used with various soil types. The direct count appears accurate, as known numbers of algae were recovered efficiently from sterile soils. Cells at all stages of growth fluoresced red when illuminated with u.v. light and non-viable cells did not, illustrating that the method promises to be useful for determining survival of algae in chemically treated soils.

77-2002. Johnen, B. G.; Drew, E. A. (Ecol. Sect., Plant Protection Div. of ICI Ltd., Jealott's Hill Res. Stn., Bracknell, Berks, England). **Ecological effects of pesticides on soil microorganisms.** *Soil Sci.* 123(5): 319-324; 1977. (26 references)

This paper outlines a methodology specifically designed to quantify soil microbial activity. This method can be combined with some descriptive methods to routinely establish whether new biocides have potentially harmful effects on soil microorganisms. The test includes methods for determining functional processes of the microbial population such as respiratory activity, nitrogen mineralization, and nitrification, and is supported by tests which describe the microflora per se (enumeration of microorganisms, measurements of microbial ATP, potential for specific enzymic activities, and determination of symbiotic nitrogen fixation). The sampling and processing of the soil for such investigations is discussed.

77-2003. Cagen, S. Z.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Liver damage following paraquat in selenium-deficient and diethyl maleate-pretreated mice.** *Toxicol. Appl. Pharmacol.* 40(2): 193-200; 1977. (13 references)

Human paraquat poisoning often includes a transient impairment of liver function before death due to pulmonary edema and fibrosis. The purpose of this study was to examine the effect of paraquat on liver function in mice fed normal lab chow, in mice fed a selenium (Se)-deficient diet for 5 weeks, and in diethyl maleate-pretreated mice (1.2 mg/kg). Liver function was determined by evaluating plasma activity of glutamic-pyruvic transaminase (SGPT), hexobarbital sleeping time, and plasma disappearance of indocyanine green (ICG). Paraquat, in doses as high as the LD50 (30 mg/kg, ip) did not alter hexobarbital sleeping time or SGPT activity in lab chow-fed mice. Selenium-deficient, paraquat-treated mice, however, had significantly elevated SGPT activity (31 units in control mice, < 1000 units in treated group), had longer hexobarbital sleeping times (from 30 min to < 180 min), and retained ICG in plasma (15-min plasma ICG concentrations of 8.4 mg/100 ml in Se-deficient paraquat-treated group vs 1.3 mg/100 ml in controls). Liver damage in Se-deficient treated mice was also observed histologically. In mice treated with paraquat, diethyl maleate pretreatment produced similar, but not as marked, effects as Se deficiency. The results suggest that paraquat alone is not hepatotoxic in mice; however, Se deficiency or diethyl maleate pretreatment may shift the organ specific toxicity of paraquat toward the liver. (Author abstract by permission)

77-2004. Gralla, E. J.; Fleischman, R. W.; Luthra, Y. K.; Hagopian, M.; Baker, J. R.; Esber, H.; Marcus, W. (Mason Res. Inst., Worcester, MA 01608). **Toxic effects of hexachlorobenzene after daily administration to beagle dogs for one year.** *Toxicol. Appl. Pharmacol.* 40(2): 227-239; 1977. (36 references)

Hexachlorobenzene (HCB) was administered daily in gelatin capsules to male and female beagles at 1000, 100, 10 and 1 mg/dog for 12 months. Mortality, anorexia, and weight loss occurred at the highest and, to a lesser degree, at the next lower dose. After 3 months, body weight stabilized or losses were regained. Clinical laboratory changes in severely affected animals which may have been related to malnutrition included anemia, hypoglycemia, hypocalcemia, and testicular degeneration. A dose-related neutrophilia appeared in the animals receiving the two high dosages. The most widespread pathological lesions were confined to the abdomen and included serositis, necrosis, fibrosis, and steatitis of the omentum. Nodular hyperplasia of gastric lymphoid tissue was found in all treated dogs including those at 1 mg/day (6.5-10.0 mg/kg). Four severely affected animals at the highest dose showed a generalized vasculitis and one had amyloidosis. One dog from each of the two highest doses had bile duct hyperplasia and pericholangitis. Bile and perirenal fat showed a time- and dose-related accumulation of HCB. No hepatic fluorescence was found at necropsy, indicating that these dogs were free of porphyria. Nevertheless, hepatic fluorescence was produced in female rats by feeding the same material used in the canine study. (Author abstract by permission)

77-2005. Mehendale, H. M. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Ctr., Jackson, MS 39216). **Effect of**

preexposure to kepone on the biliary excretion of imipramine and sulfobromophthalein. *Toxicol. Appl. Pharmacol.* 40(2): 247-259; 1977. (33 references)

The effect of kepone (chlordecone) on the biliary excretion of [^{14}C]imipramine (IMP) was studied using isolated perfused rat liver preparations obtained from control and kepone-pretreated animals. Biliary excretion of endogenously formed polar metabolites of IMP wwas markedly suppressed (70%) by preexposure to kepone at 200 ppm in daily ration for 8 days. *In vitro* addition of kepone at 500 μM concentration to the perfusate of untreated liver preparations elicited a 20% decrease in the biliary excretion of endogenously formed metabolites. At concentrations up to 50 μM, kepone was without any discernible effect. The marked suppression of biliary elimination of endogenously formed metabolites is unrelated to the rate of metabolism of IMP. Furthermore, the biliary excretion of exogenously provided polar metabolites of IMP was also suppressed (61%) by preexposure to kepone. This suppression of biliary excretion of IMP metabolites was accompanied by an increase in the bile flow suggesting a dichotomy between bile secretion and biliary excretion. *In vitro* addition also resulted in a suppression (48%) of biliary elimination of exogenously provided metabolites of IMP. In the experiments in which kepone was added, bile flow was unaffected. Biliary excretion of sulfobromphthalein (BSP) was unaffected by preexposure to kepone, suggesting that kepone-induced impairment of hepatobiliary function may not be detected by BSP clearance tests. In addition, different mechanisms might be involved in the transport of IMP metabolites and BSP across the biliary canaliculi. From these results, it is suggested that the kepone-induced impairment of hepatobiliary function may be located at the site of transfer of metabolites across the bile canaliculi. (Author abstract by permission)

77-2006. Friedenbach, D. J.; Davison, K. L. (Zool. Dep., North Dakota State Univ., Fargo, ND 58102). **Scanning and transmission electron microscopic changes associated with duck and chicken shell gland cilia after *p,p'*-DDT administration.** *Toxicol. Appl. Pharmacol.* 40(2); 291-297; 1977. (17 references)

DDT has been reported to cause eggshell thinning in a variety of avian species. The domesticated mallard duck (*Anas platyrhynchos*) is susceptible to DDT-induced eggshell thinning, but the domesticated chicken (*Gallus domesticus*) is not. Scanning (SEM) and transmission (TEM) electron microscopic examination of duck and chicken shell glands revealed surface morphological variations after treatment with *p,p'*-DDT. Cilia on shell gland epithelia of control birds contained an irregular, bulbous surface, whereas cilia of shell glands from *p,p'*-DDT-treated birds were smoother. This same variation, associated with *p,p'*-DDT treatment, occurred when, with the use of a biopsy technique, the same birds were used as their own controls. The bulbous surface features is suggestive of a secretory function of the cilia. *p,p'*-DDT treatment abolishes this structural modification. This change in morphology was consisted in both *p,p'*-DDT-sensitive and -nonsensitive species. (Author abstract by permission)

77-2007. Zhavoronkov, I. I.; Antsiferov, S. D. (All-Union Inst. Exp. Vet. Med., Moscow, USSR). **Raspredelene, nakoplenie i vydelenie TMTD iz organizma zhivotnikh. [Distribution, accumulation, and excretion of TMTD from animals.]** *Veterinariya* 2: 95-96; 1977. (Russian)

Animals were poisoned with 50% technical TMTD (thiram) and killed at different intervals afterwards. Colorimetric determinations were performed on the degree of accumulation of the pesticide, its distribution in organs and tissues, and the length of its discharge via milk and eggs. The same pattern was found in all animals studied (sheep, young pigs, adult pigs, and chickens): rapid absorption from the gastrointestinal tract into the blood and then distribution to all organs and tissues. The maximum concentration is found after one day; the highest quantity is found in the blood, spleen, liver and lungs; and the persistence in the body is 13-20 days. In the study of the duration of discharge of TMTD with the milk and urine of cows and the eggs and droppings of chickens, it was found that the maximum concentration is reached in all of these after 24 hours, and the pesticide is completely eliminated after 15 days. Cooking the chicken meat for 1.5 hours reduced this concentration by 80%; however, contaminated food cannot be sold, but must be sold for industrial use. Fast absorption into the blood and discharge with milk and urine and droppings makes possible the early diagnosis of poisoning.

77-2008. Giannopolitis, G. N.; Bies, S. K. (Dep. Hortic., Pestic. Res. Ctr., Michigan State Univ., East Lansing, MI 48824). **In vitro production of superoxide radical from paraquat and its interactions with monuron and diuron.** *Weed Sci.* 25(4): 298-303; 1977. (24 references)

The ability of herbicides to either produce superoxide radical or react with this radical were examined. The effect of the herbicides on the superoxide-induced reduction of *p*-nitro blue tetrazolium chloride was used as an index. Paraquat (1,1'-dimethyl-4,4' bipyridinium ion) enhanced and diuron [3-(3,4-dichlorophenyl)-1,1- dimethylurea] inhibited the reduction of *p*-nitro blue tetrazolium chloride. Paraquat was reduced photochemically (riboflavin/methionine) or enzymatically (xanthine oxidase) and produced superoxide radical upon reoxidation. Diuron and monuron [3-(*p*-chlorophenyl)- 1,1-dimethylurea] interacted with photochemically produced superoxide radical, but not with enzymatically produced superoxide radical. The product of the monuron/superoxide interaction was a demethylated, dechlorinated, water-soluble compound containing phenolic hydroxyl group(s), and was not toxic to oats (*Avena sativa* L.). The enzyme superoxide dismutase prevented the formation of this product. (Author abstract by permission)

77-2009. Hodgson, R. H.; Hoffer, B. L. (Plant Physiol., Metabolism Radiat. Res. Lab., Agric. Res. Serv., Fargo, ND 58102). **Diphenamid metabolism in pepper and an ozone effect. I. Absorption, translocation, and the extent of metabolism.** *Weed Sci.* 25(4): 324-330; 1977. (16 references)

Nutrient solution-grown pepper (*Capsicum frutescens* L. 'Early Calwonder') absorbed 62% of the diphenamid (*N,N*-dimethyl-2,2- diphenylacetamide) supplied via the roots in 48 hr, and 74% in 150 h. Extensive translocation accompanied absorption, and 70 ± 3% of the absorbed ^{14}C was present in shoots of plants harvested after 24- to 150-h treatments. Diphenamid was metabolized rapidly to chloroform-soluble and water-soluble compounds, and to unextracted residues. Chloroform-soluble compounds persisted for 150 h and accounted for more than 50% of the water-soluble metabolites in leaves of nonfumigated plants. Ozone fumigation did not affect diphenamid absorption or translocation significantly. In leaves, ozone-enhanced accumulation of water-soluble metabolites more polar than *N*-hydroxymethyl- *N*-methyl-2,2- diphenylacetamide-β-D-glucoside (MDAG) and unextracted residues was observed. Ozone fumigation reduced the accumulation of these ^{14}C-fractions in roots. (Author abstract by permission)

77-2010. Hodgson, R. H.; Hoffer, B. L. (Metabolism Radiat. Res. Lab., Agric. Res. Serv., Fargo, ND 58102). **Diphenamid metabolism in pepper and an ozone effect. II. Herbicide metabolite characterization.** *Weed Sci.* 25(4): 331-337; 1977. (7 references)

Metabolites of diphenamid (*N,N*-dimethyl-2,2-diphenyl acetamide) were purified from extracts of pepper plants (*Capsicum frutescens* L. 'Early Calwonder') treated via nutrient solution with the herbicide or several of its analogs. The major metabolites were characterized. Diphenamid was metabolized partially via a previously unreported pathway to *N,N*-dimethyl- 2-phenyl-2- [(hydroxyphenyl)- β-O-D-glucosyl] acetamide and its monomethyl analog, and to *N*-hydroxymethyl glucosides previously reported in other species. Ozone fumigation stimulated the production of both types of glycoside conjugates. Leaves of plants that had been treated with 30 μM diphenamid and fumigated with ozone for 146 to 149 h contained 304 and 560 nmoles per gram of fresh weight of the hydroxyphenyl and *N*-hydroxymethyl conjugates, respectively. (Author abstract by permission)

77-2011. Hoeflich, G. (Forschungszentr. Bodenfruchtbarkeit, Akad. Landwirtschaftswiss., Muncheberg, DDR). **Einsatz von Bioziden zur Beeinflussung der Bodenmikroflora and deren Umsetzungen. 4. Mitteilung:Einfluss von strohabbauhemmenden Wirkstoffen auf den Stickstoffumsatz.** [**The use of biocides to modify the soil microflora and its reactions. Part 4: The effect of substances inhibiting straw decomposition on nitrogen transformation.**] *Zentralbl. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. Z.*, 132(2): 155-162; 1977. (10 references) (German)

Biocidal materials which inhibit carbon transformations in straw, such as TCP (trichlorophenol), thiram, and TBTO (tributyltin oxide) also retard nitrification. Urea at high doses can also inhibit nitrification. The duration of such effects varies in relation to the doses applied and the amounts of organic matter present. Urease activity and ammonification were not affected by these agents at the quantities customarily applied. Nitrogen-fixing *Azotobacter* species were inhibited by TCP, urea, and chloramphenicol, but their growth was promoted by thiram and WTZ II 277 (an organotin compound) following a brief period of suppression. Nitrification was inhibited by concentrations lower than the fungicidal levels.

77-2012. Toure, I. M.; Stenz, E. (Lehrber. Pflanzenphysiol. Mikrobiol., Sekt. Biowiss., Karl Marx Univ., Leipzig, DDR). **Der Einfluss ausgewaehlter Herbizide auf Bakteriophagen und *Escherichia coli*.** [**The effect of selected herbicides on bateriophages and *Escherichia coli*.**] *Zentralbl. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. II* 2:132(2): 163-177; 1977. (21 references)

The effect of herbicides on the multiplication of microorganisms was tested using *Escherichia coli* strains W1665F and C600 and the RNA-phage M12 and the DNA-phage λ. Turbidimetric methods and one-step growth experiments were used. Seven of the herbicides inhibited *E. coli* at 1 m*M* and sometimes at 0.2 m*M* or even lower concentrations. The exception was naphthylacetic acid which, practically independent of its concentration, caused increased density of bacteria in fluid culture. MCPA, CMPP, 2,4-D, and 2,4-DP inhibit the multiplication of M12 phage, sometimes over broad concentration ranges; its growth is stimulated by NES and amitrole. Multiplication of λ phage is inhibited only by CMPP. MCPA, MCPB, and phenylacetic acid interfere with lysogenization of the bacteria and increase the lytic activity of the λ-phages; 2,4-DP and NES also have the latter effect.

See also **77-1821 77-1823 77-1836 77-1904 77-1912**

77-2013. Buser, H. R. (Swiss Fed. Res. Stn., CH-8820 Wadenswil, Switzerland). **Determination of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in environmental samples by high-resolution gas chromatography and low resolution mass spectrometry.** *Anal. Chem.* 49(7): 918-922; 1977. (16 references)

High-resolution gas chromatography in combination with mass spectrometric detection (mass fragmentography) was demonstrated to be a powerful means for detecting trace amounts of 2,3,7,8-TCDD in environmental samples. The separation of different TCDD isomers was studied on OV-101 and OV-17 glass capillary columns and some differences in the mass spectra of these isomers were pointed out. TCDD in environmental samples from Seveso, Italy, had the same retention times on these columns and the same mass spectrum as standard 2,3,7,8-TCDD. (Author abstract by permission)

77-2014. Sherma, J.; Koropchak, J. (Chem. Dep., Lafayette Coll., Easton, PA 18042). **Determination of chlorophenoxy acid herbicides by densitometry on thin layer chromatograms.** *Anal. Chim. Acta* 91(2): 259-266; 1977. (22 references)

A quantitative in situ TLC method for the determination of chlorophenoxy acid herbicides and their salts in waters is described. The detection limit (1 ppb) is similar to tht obtainable by gas chromatography, but no derivatization is needed. Silica gel G plates are pre-impregnated with a sensitized silver nitrate reagent, and the spots are scanned with a densitometer after u.v. irradiation. Linear calibration graphs were obtained in the range 100-1000 ng for most of the herbicides studied. Preliminary cleanup methods are discussed. (Author abstract by permission)

77-2015. French, M. C.; Sellers, D. J.; Wilkinson, R. G. (Chem. Defence Establ., Porton Down, Salisbury, Wilts, England). **A comparison of methods for measuring acetyl cholinesterase activity in blood samples inhibited by carbamates.** *Biochem. Pharmacol.* 26(13): 1263-1266; 1977. (9 references)

An unambiguous method based on the measurement of the acetylcholinesterase activity resulting from complete decarbamoylation of the acetylcholinesterase in blood samples inhibited by a carbamate is described and compared with a spectrophotometric modification of Ellman's method. (Author abstract by permission)

77-2016. Serat, W. F.; Van Loon, A. J.; Lee, M. K. (Epidemiol. Studies Program, State Dep. Health, Berkeley, CA 94704). **Micro sampling techniques for human blood cholinesterase analysis with the pH stat.** *Bull. Environ. Contam. Toxicol.* 17(5): 542-550; 1977. (5 references)

The use of commercially available, heparin-coated, disposable glass micropipets of constant bore and accurate calibration for drawing blood to be used in the determination of cholinesterase activity was studied. Using a single venous blood sample, a series of determinations incorporating both the micropipet modification as well as the standard pH Stat procedure were made to compare the precision and variability of the former procedure with that of the latter. The coefficients of variation were all within 5%. There was generally good agreement between values for cholinesterase activities, measured or calculated, as determined by the two methods. Correlation coefficients were high for plasma and whole blood enzyme activities but were lower for the RBC activities. The earlobe appears to offer another convenient source of blood, particularly when there are objections to venipuncture. Blood can be retained for 1.5-2 times longer in micropipets than in vacutainer tubes under both refrigerated and room temperature conditions without loss of activity.

77-2017. Purohit, M.; Mall, L. P.; Dubey, P. S. (Weed Res. Lab., Sch. Studies in Botany, Vikram Univ., Ujjain, India). **Herbicidal pollution—chlorophyll content as an index of residual toxicity.** *Curr. Sci.* 46(5): 157-158; 1977. (13 references)

Prefix (chlorthiamid), Bladex (cyanazine), and Planavin (nitralin) were mixed in the garden soil on a 50 ppm by weight basis. About 20 cm of rainfall fell during the course of the experiment. Additionally these soils were leached with 16 liters of water. *Civer arietinum* was grown in these soils as test plants. Plants grown in pots containing each type of herbicide-treated soil showed reductions in chlorophyll content. Planavin residues were the most toxic, showing a 30.2% reduction. This was followed by Bladex with a 21.6% reduction, 2,4-D (13.11%) and Prefix (4.5%). This quantitative reduction in chlorophyll indicates the pollution potentials of these herbicides with reference to the soils of this particular region of India.

77-2018. Ward, P. M. (Food Drug Admin., Boston, MA 02109). **Confirming heptachlor and heptachlor epoxide in food samples by gas-liquid chromatography of their photoderivatives.** *J. Ass. Offic. Anal. Chem.* 60(3): 673-678; 1977. (5 references)

The food sample extract is cleaned up on a Florisil column and the 6% ethyl ether in petroleum ether eluate is subjected to repeated concentrations, using a micro-Snyder column, to expel volatile materials that absorb ultraviolet (UV) light. The sample and standard solutions of heptachlor and heptachlor epoxide are placed in quartz cells and exposed to UV radiation in the dark. Characteristic photoderivatives of the respective pesticides which form in the sample extract are identified and measured by comparison with those formed in the irradiated standard solutions, using electron capture gas-liquid chromatography. Recoveries of the 2 pesticides from 13 products, fortified at levels from 0.01 to 0.3 ppm and determined after derivatization, ranged from 67 to 110%. (Author abstract by permission)

77-2019. Onley, J. H. (Environ. Protect. Ag., Registration Div., Washington, DC 20460). **Gas-liquid chromatographic determination of captan and two metabolites in milk and meat.** *J. Ass. Offic. Anal. Chem.* 60(3): 679-681; 1977. (3 references)

A gas-liquid chromatographic (GLC) method has been developed for the determination of captan (*N*-trichloromethylthio- 4-cyclohexane- 1,2-dicarboximide) and 2 metabolites, tetrahydrophthalimide (THPI) and tetrahydrophthalamic acid (THPMA), in milk and meat. The sample is extracted with ethyl acetate and is cleaned up by acetonitrile partition and silica gel chromatography where captan, THPI, and THPMA are separated. Captan is directly determined by GLC. THPI and THPMA are separately derivatized in an acetone solution of pentafluorobenzyl bromide. The resultant derivatives are purified separately on the Al_2O_3 column and quantitated by GLC, using an electron capture detector. Recoveries from milk samples fortified at 0.02-10 ppm ranged from 71 to 102%; recoveries from meat samples fortified at 0.04-10 ppm ranged from 75 to 99%. (Author abstract by permission)

77-2020. Lane, L. G.; Gray, T. C.; Minyard, J. P., Jr. (Mississippi State Chem. Lab., Pestic. Residue Sect., Mississippi State, MS 38762). **Aluminum oxide cleanup of feed grade fats for residues of dieldrin.** *J. Assoc. Off. Anal. Chem.* 60(3): 682-684; 1977. (8 references)

A method is described for the analysis of dieldrin in feed grade fats. Fat samples in petroleum ether are cleaned up by column chromatography on 10% deactivated aluminum oxide followed by Florisil and analyzed by electron capture gas chromatography. Fourteen laboratories tested the method for determining dieldrin in naturally contaminated feed grade fats. Recoveries averaged > 90% with a coefficient of variation of 13% (0.54 ppm ± 0.07), indicating that the method is sufficiently reproducible to be used by different laboratories for detecting dieldrin in feed grade fats. (Author abstract by permission)

77-2021. Solomon, J.; Lockhart, W. L. (Environ. Canada, Freshwater Inst., Winnipeg, Manitoba, Canada R3T 2N6). **Rapid preparation of micro sample and gas-liquid chromatographic determination of methoxychlor residues in animal tissues and water.** *J. Assoc. Off. Anal. Chem.* 60(3): 690-695; 1977. (8 references)

Methods are described for analyses of methoxychlor (2,2-bis(*p*-methoxyphenyl)- 1,1,1-trichloroethane) in tissues of fish and invertebrate animals and in water samples. These micro methods offer economy in solvents and materials, and reduce health and fire hazards. Furthermore, the methods sufficiently reduce sample weights to allow analyses of small animals (mayflies) or animal organs. Samples are extracted in a ball-mill with *n*-hexane, and lipids are removed from fatty samples by freezeout. Small Florisil columns give final lipid cleanup and partial separation of methoxychlor from interfering materials. Methoxychlor is determined on a short gas-liquid chromatographic column (retention time 2.2 min). Animal tissue samples as small as 0.1 g and water samples of 5 ml can be analyzed at sensitivites of 10 and 1 ppb, respectively. Methoxychlor recoveries were 84-101% (fish and crab tissue), 92-100% (cod liver oil), and 98-107% (water) over a concentration range of 0-10 ppm. Results obtained for fish tissue by using micro procedures agreed to within 20% with results reported by an independent laboratory using an established method. (Author abstract by permission)

77-2022. Machin, M. V.; Dingle, J. H. P. (New South Wales Dep. Agric., Bd. Tick Control, Lismore, N.S.W., Australia). **Ultraviolet determination of chlordimeform in cattle baths and dipping sprays.** *J. Assoc. Off. Anal. Chem.* 60(3): 696-698; 1977.

A simple and reliable method has been developed for determining chlordimeform. A preliminary cleanup converts chlordimeform to its hydrochloride and removes ultraviolet-absorbing impurities. The aqueous acid phase containing chlordimeform HCl is diluted and passed through a silica gel column. The column effluent is used as the reference solution and a portion not eluted through silica gel is used as the sample solution in the spectrophotometer. The absorbance at 240 nm is measured, and chlordimeform concentration is determined from the calibration graph. The method applied to solutions of acaricides gives good results in the range of 0.02-0.06% w/v chlordimeform; higher concentrations may be determined by appropriate dilutions. (Author abstract by permission)

77-2023. Mandrou, B.; Brun, S.; Kingate, A. (Fac. Pharm., Lab. Chim. Anal. Toxicol., 34060 Montpellier Cedex, France). **Quantitative determination of thiourea in citrus fruits.** *J. Assoc. Off. Anal. Chem.* 60(3): 699-701; 1977. (9 references)

A quantitative method for thiourea determination in orange peels is proposed, with direct reflectance spectrometric measurements on chromatoplates. Thiourea is separated on a silica gel plate with methanol-chloroform (10+90), and the spots are characterized with 2,6-dichloroquinone chloroimide; this colorimetric reaction is unstable, so thiourea is quantitated on the chromatogram by direct ultraviolet reflectance spectrometric measurements at 240 nm. Comparison between this method and the AOAC colorimetric method shows interferences and higher results in the colorimetric assay. By slightly modifying the extraction technique, such as purifying the extract on an alumina column, it is possible to decrease these interferences and to avoid erroneous results with the AOAC colorimetric method. For both methods, colorimetry in solution and reflectometry on chromatoplates, applied after the proposed extraction technique, the sensitivity is about 1 ppm and the reliabilities are similar. (Author abstract by permission)

77-2024. Ross, M. S. F. (Pharmacol. Dep., Welsh Sch. Pharm., Univ. Wales Inst. Sci. Technol., Cardiff, Wales). **Pre-column derivatization in high-performance liquid chromatography.** *J. Chromatogr.* 141(1): 107-119; 1977. (74 references)

Pre-column derivatization in high-performance liquid chromatography is mainly used to increase the detectability of compounds requiring analysis. This normally involves reaction with chromogenic or fluorogenic reagents, and thus the use of the more commonly available HPLC detectors. Derivatization is more rarely used to alter chromatographic properties of compounds or to allow the resolution of optical isomers. Applications of pre-column derivatization are discussed by reference to the functional group of the substrate involved in the derivatization reaction. (Author abstract by permission)

77-2025. Thomas, T. C.; Jackson, J. W. (Environ. Health Lab., McClellan AFB, CA). **An evaluation of a commercial instrument for chlordane and heptachlor sampling.** *Natl. Tech. Inform. Serv.* AD-020,337, 1975, 1975, 24 p.

A commercial pesticide sampler was evaluated for chlordane and heptachlor sampling. The sampler can obtain samples at rates up to 6.5 ft3/min through each of two collectors. Collectors are glass fiber filters impregnated with a polymeric medium. Chlordane and heptachlor appear to be collected by several modes: filtration, adsorption, diffusion and gas-solid partitioning. Analyses showed that the compounds were collected efficiently on the collector and retained. A detection level approximately 20 parts per trillion can be obtained with a one hour sample. The sampler is flexible and quite easy to use. Several problems are associated with operation of the sampler. Suggested improvements are discussed in the report. Suggestions for further work are also included. (Author abstract by permission)

77-2026. Hall, R. C. (Dep. Entomol., Purdue Univ., Lafayette, IN). **Optimization and evaluation of a microelectrolytic conductivity detector for the gas chromatographic determination of pesticide residues.** *Natl. Tech. Inform. Serv.* PB-250,451, 1976, 164 p.

A microelectrolytic conductivity detector has been optimized and evaluated for the determination of halogen, nitrogen, and sulfur-containing pesticide residues in water, soil and biological samples. The influence of detector operating parameters on detector sensitivity and specificity to model compounds was investigated. Specific parameters studied included furnace temperature, reaction gas, reaction gas flow-rate, conductivity solvent, conductivity solvent flow-rate, reactor contact material, and abstracting agents. Detection limits of representative pesticides were determined for a variety of sample types using optimized detector operating conditions. (Author abstract by permission)

77-2027. Kurosawa, K.; Suzuki, A.; Asanuma, S.; Miyairi, K. (Japan Inst. Rural Med., Usuda, Nagano, Japan). **[Comparison of delta ph method and colorimetry using DTNB in determination of cholinesterase activity.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 26(1): 61-62; 1977. (Japanese)

Using blood collected from 200 men and 200 women in the Suwa-Matsumoto area, cholinesterase activity was determined by the delta pH method, automatic colorimetry, and manual colorimetry using DTNB. The range of activity was 7-8 I.U. in men, compared to 7-9 I.U. by the automatic DNTB method using acetylthiocholine, which gave the highest values. The values found by the delta pH method were the lowest. Colorimetry with DNTB was thought to be superior to the conventional delta pH method because the values were not affected by the pH of the blood sample, the accuracy was higher, and the necessary sample was smaller.

77-2028. Farrington, J. A. (ICI Plant Prot. Div., Jealott's Hill Res. Stn., Bracknell, Berks RG12 6EY, England). **Estimation of acid dissociation constants from potentiometric titration curves.** *Pestic. Sci.* 8(2): 127-136; 1977. (9 references)

A computer program has been developed for fitting theoretical curves to data points obtained in pH titrations of weak acids or bases. The logarithm of the acid dissociation constant (-pKa) and end point are optimized by the program and any strong acid or base which may be present as an impurity is allowed for. Activity coefficient corrections are included. It is applicable to mono-, di- and tribasic acids, including those with overlapping ionization regions. The choice of concentration at which to carry out the titration in order to obtain a reliable pKa is discussed. (Author abstract by permission)

77-2029. Munro, H. E. (Agric. Chem. Br., Dep. Primary Ind., Brisbane, Queensland, Australia). **Determination of individual esters of 2,4-D and 2,4,5-T in commercial crops.** *Pestic. Sci.* 8(2): 157-162; 1977. (6 references)

A rapid gas chromatographic method for the determination of the individual esters of 2,4-D and 2,4,5-T in tomato plants and other commercial crops is described. Several suitable esters can be determined at one time. Separation is by steam distillation into a hexane trap followed by clean-up on a column of Florisil. Using a sample of plant material (100 g), 1 μg of each of the esters in the mixture can be determined with recoveries of 72-96% for 2,4-D esters and 66-84% for 2,4,5-T esters. (Author abstract by permission)

77-2030. Alam, M. (Dep. Primary Ind., Queensland, Australia 4068). **Analytical method for traces of hexachlorobenzene in formulations of other pesticides.** *Pestic. Sci.* 8(2): 167-171; 1977. (8 references)

A method is described for the analysis of trace

levels of hexachlorobenzene in pesticide formulations. The method involves the conversion of hexachlorobenzene to pentachlorophenol which is converted to the acetate and analyzed on a gas chromatograph using microcoulometric detection. This technique allows separation of hexachlorobenzene from most constituents of the pesticide formulations. (Author abstract by permission)

77-2031. Yamato, Y.; Suzuki, M.; Watanabe, T. (Kitakyushu Municipal Inst. Public Health, Kitakyushu, Fukuoka, Japan). [**Data processing analysis of sulfur-containing organophosphorus insecticides by gas chromatography.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(3): 273-277; 1977. (9 references) (Japanese)

Analytical methods and data processing for sulfur-containing organophosphorus insecticides were examined on a dual channel instrument with two digital integrators connected to a dual channel FPD gas liquid chromatograph. In the P mode the calibration curves of the examined insecticides showed linearity from 0 to several thousand ng, and in the S mode they also showed linearity, although on a log-log scale. Moreover, this system was usable for simultaneous identification of insecticides containing sulfur and phosphorus. Separation of salithion, malathion, fenitrothion, ethion, and EPN could be done on Apolar 10 C. Only ronnel, fenitrothion, ethion, and EPN could be done on QF-1. Apolar 10C seemed to be effective in analyzing organophosphorus insecticides. Interfering substances from cabbage, Chinese cabbage and cucumber were seen at lower RT in the S mode, but they were almost not seen in the P mode.

See also **77-1957**

PESTICIDES ABSTRACTS

QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other compound designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc).

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